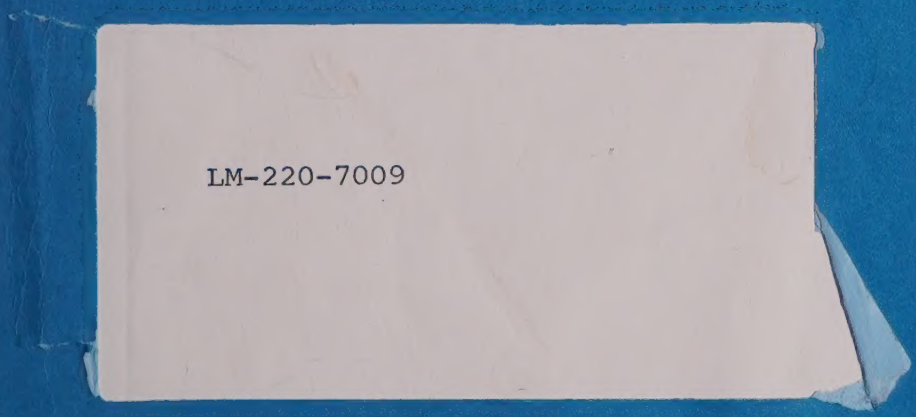
INSTRUCTION MANUAL

REGULATED POWER SUPPLIES



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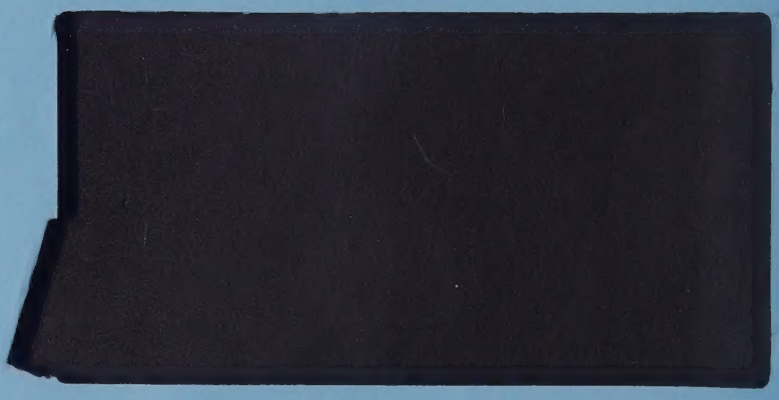
LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



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ddenda

dded Parts List

chematic (Size A)

TD Instruction Manual: LM-220

ADDENDA

LM-220-7009

The paragraphs of this instruction manual apply in general to the above model.

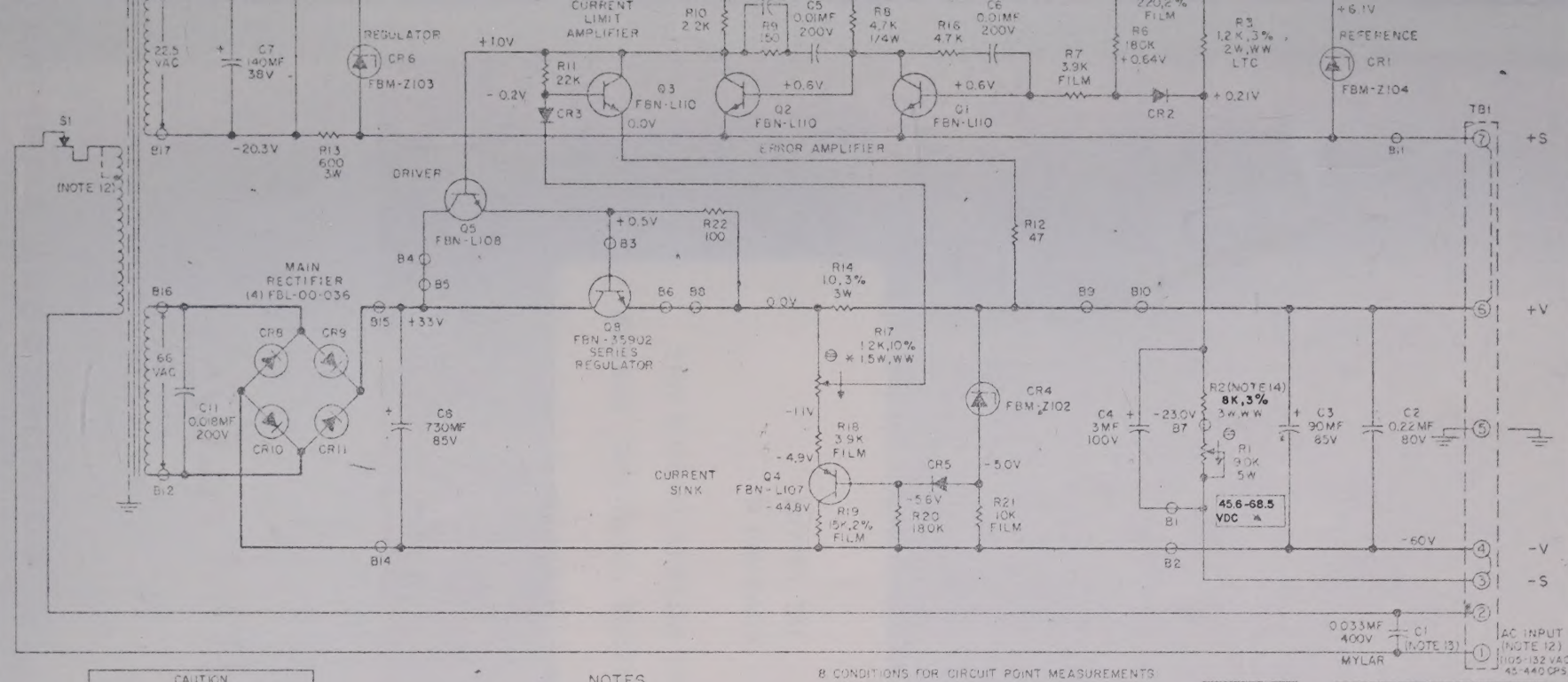
This modified unit differs from a standard unit in the following way (s):

The DC output is 45.6V to 68.5V @ .4A @ 40°C

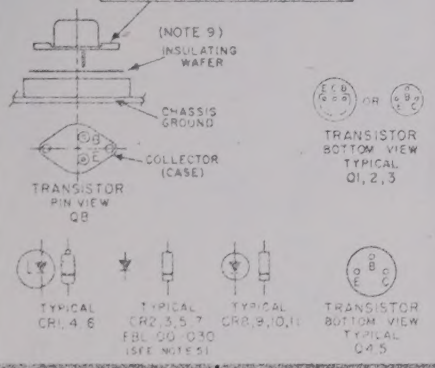
DEVIATION FROM AND/OR ADDED PARTS TO STANDARD ELECTRICAL PARTS LIST

Model #LM220-7009

CIRCUIT DESIG.	DESCRIPTION	LAMBDA NO.
R2	Res. FXD. W.W. 8KΩ, ± 3%, 3W	DFS-80-054



CAUTION
NOT AT CHASSIS GROUND POTENTIAL
DO NOT SHORT TO CHASSIS GROUND



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING.
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55 Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 CPS, OUTPUT: 60VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. R10 WAS 3.9K AND R11 WAS 6.8K ON UNITS WITH SERIAL NO. PREFIX 'A'.
11. C12 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.
12. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS, T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
13. ON UNITS WITH "V" OPTION, C1 IS 0.01MF±10%, 1000V, PAPER.
14. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	
Q7	R15
C9	
C10	

RATING TABLE	
AMB TEMP	MAX LOAD
40°C	0.40A

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.
DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
LM220-7009

LAMBDA ELECTRONICS MELVILLE, NEW YORK
DIVISION OF VECO INSTRUMENTS INC.

A	ORIG	DFK	10/19/77

INSTRUCTION MANUAL

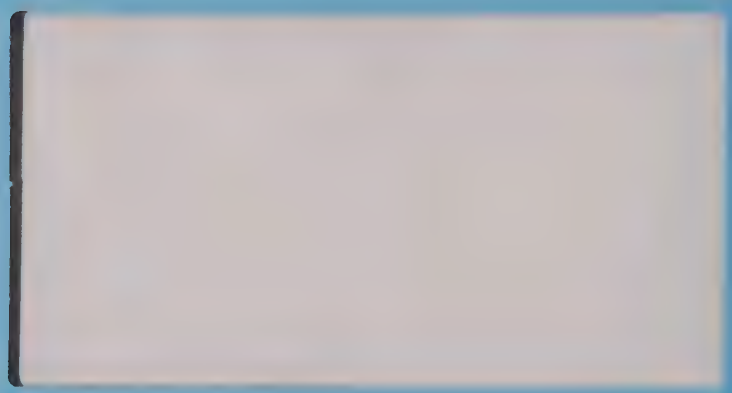
REGULATED POWER SUPPLIES

MODEL LM
B PACKAGE

THIS MANUAL APPLIES TO UNITS
BEARING SERIAL NO. PREFIXES A-F

LAMBDA

LAMBDA ELECTRONICS MELVILLE, L. I., N. Y.



INSTRUCTION MANUAL

FOR

REGULATED POWER SUPPLIES

MODEL LM

B PACKAGE

THIS MANUAL APPLIES TO UNITS

BEARING SERIAL NO. PREFIXES **A-F**

This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics.

LAMBDA ELECTRONICS MELVILLE, L.I., N.Y.

MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LMB

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SPECIFICATIONS AND FEATURES

The following specifications apply for all Lambda B package LM power supplies. Specification exceptions noted here relate to models incorporating model option "Y" and/or "T" . Performance specifications do not change for models with suffix "R", e.g., LM-B2-R unless the models also include model options "Y" and/or "T" or "V" e.g., LM-B2-YR; for these models the appropriate specification exceptions also apply

NOTE: Specifications in italics apply only for Lambda models with a "Y" suffix, e.g., LM-B2-Y. AC INPUT specification with an asterisk*, applies only for Lambda models with a "T" or "V" suffix, e.g., LM-B2-YT.

DC OUTPUT--Voltage regulated for line and load

Voltage Range....For voltage range see table I of pertinent model group

Multi-Current Ratings....Current ratings specified for each maximum ambient temperature apply over entire output voltage range, with input frequency 55-65 cps. For input frequencies 45-55 at 105-132 VAC, 200-250 VAC, or 205-265 VAC delete 40°C rating.

For input frequencies 360-440 cps, consult factory for current ratings.

For maximum current ratings at each ambient temperature see table I of pertinent model group

REGULATED VOLTAGE OUTPUT

Regulation (line)... Less than 0.05 percent plus 4.0 millivolts for input variations from 105-132 or 132-105 volts AC

... Less than 0.01 percent plus1.0 millivolt for input variations from 105-132 or 132-105 volts AC

Regulation (load)... Less than 0.03 percent plus 3.0 millivolts for load variations from 0 to full load or full load to 0

... Less than 0.02 percent plus 2.0 millivolts for load variations from 0 to full load or full load to 0

Remote Programming

External Resistor... Nominal 200 ohms/volt output

Programming Voltage. . One-to-one voltage change

Ripple and Noise...One millivolt rms; 3 millivolts peak-to-peak

... 0.5 millivolt rms; 1.5 millivolts peak-to-peak with 60 cps input

... 1.0 millivolt rms; 3 millivolts peak-to-peak with 400 cps input

Temperature Coefficent.. Change in output voltage less than 0.03%/°C

... Change in output voltage less than 0.01%/°C

AC INPUT--105-132 volts AC at 45-440 cps; 80 watts+

+ With output loaded to full 40°C rating and input voltage 132 volts at 55-65 cps.

*... 200-250 volts AC at 45-440 cps ("T" option)

*...205-265 or 187-242 volts AC at 45-440 cps ("V" option)

When fusing of input power line is planned, use a 2.0 ampere type 3AG "SLO-BLO" fuse.

OVERLOAD PROTECTION

Thermal....Thermostat resets automatically when overtemperature condition is eliminated

Electrical...Within rated voltage range, an automatic electronic current-limiting circuit limits output current to approximately 110 percent of 40°C rated current for protection of load and power supply; for overloads approaching short circuit, both voltage and current decrease until at short circuit, current is reduced to a safe value, except for models LMB-0-7, 0-14, 0-32 and 0-60, where output current remains limited to 110 percent of 40°C rated current at 40°C ambient.

OVERSHOOT--No overshoot of output voltage under conditions of power turn-on, power turn-off, or power failure

INPUT AND OUTPUT CONNECTIONS--Heavy duty terminal block on rear of chassis

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE--Continuous duty from -20°C to 71°C ambient with corresponding load current ratings for all modes of operation, and all mounting positions

STORAGE TEMPERATURE-- -55°C to +85°C

CONTROLS

DC output control...Voltage adjust control permits adjustment of DC output voltage via access hole located in nameplate.

REMOTE SENSING--Provision is made for remote sensing to eliminate effect of power output lead resistance on DC regulation.

PHYSICAL DATA

Size ..... 3-3/16" H x 4-15/16" W x 6-1/2"D

Weight ..... 6 lbs. net; 7 lbs. shipping wt.

Finish ..... Grey, FED STD 595 No. 26081

MOUNTING--Three surfaces, each with tapped mounting holes, can be utilized for mounting this unit. All LMB power supplies can be mounted with Top, Front, or Right Side facing up. Top, Front or Right Side must be in a horizontal plane. Refer to figure 9 for mounting details.

ACCESSORIES

Rack Adapters...Rack adapters LRA-4 and LRA-6, used for ruggedized mounting with or without chassis slides, are available, as well as rack adapters LRA-3 and LRA-5 which are used for simple rack installations where chassis slides are not required.

Metered and Non-Metered Panels...Metered panels MP-3, MP-5 and Non-Metered panels P-3, P-5 are available for use with the Lambda rack adapters.

Blank Panels...Full-rack, half-rack and quarter-rack panels can be used with the Lambda rack adapters. The following chart lists the panels and rack adapters that can be utilized together.

Rack Adapter	BLANK PANELS			Metered/Non Metered Panel
	1/2 Rack	1/4 Rack	Full Rack	
LRA 3	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 6	LBP-20	LBP-10	LBP-40	MP-5, P-5
LRA 4	LBP-50	LBP-60	LBP-30	MP-3, P-3
LRA 5	LBP-50	LBP-60	LBP-30	MP-3, P-3

Overvoltage Protector... Externally mounted, Overvoltage Protectors LMOV-1, LMOV-2 and LMOV-3 are available for use with Lambda LM power supplies.

MODEL OPTIONS

Suffix "T" Input Option... Standard LM power supplies are available for operation with 200-250 volt, 45-440 cps input.

Suffix "Y" High Performance Option... All Lambda LM power supplies are available with high performance specifications. See italicized entries under SPECIFICATIONS AND FEATURES.

Suffix "R" Fungus Proofing Option... Standard LM power supplies can be obtained with fungus proofing treatment with MIL V 173 varnish for all fungi nutrient components.

Suffix "V" Input Option... Standard LM power supplies are available for operation with 205-265 volt 45-440 cps input, or 187-242 volt 45-440 cps input. See nameplate for AC input rating; see schematic diagram for rewiring of AC input.

Suffix "S" Option... Standard LM power supplies are available for use with Lambda Systems Power Sequencer or Systems Power Protector. On all fixed voltage LMB power supplies specified with the "S" option, resistor R2 is replaced by a jumper.

THEORY OF OPERATION

GENERAL

The Lambda power supply consists of an AC input circuit and transformer; a bias supply consisting of an auxiliary rectifier, filter, and a zener diode regulator; and a main regulator circuit consisting of the main rectifier and filter, a series regulator, emitter follower driver, an error amplifier, a current limit amplifier, an output voltage sensing circuit and an output current sensing circuit. In addition, certain models also contain a current sink circuit.

The circuit arrangement is shown in block diagram form in figure 7. The circuitry is discussed with reference to the block diagram and the schematic diagram.

FUNCTIONAL DESCRIPTION

Single phase input power is applied to transformer T1 through the input circuit containing thermostat S1, which protects the supply against overheating.

The main rectifier, a full-wave rectifier, provides the power which is filtered by capacitor C8 and then regulated via a series regulator and delivered to the output. Bias supply, half-wave, auxiliary rectifier CR7, provides voltage filtered by capacitor C7 and regulated by zener diode CR6 for current limit amplifier Q3 and error amplifier Q1, Q2 (or, as applicable, for voltage amplifier Q2). Zener diode CR1 and resistor R5, across the bias supply, provide a regulated temperature compensated reference voltage. Resistor R4 compensates for input voltage variations.

Operation of the voltage regulator circuit is determined by changes in the output voltage. A change in the output voltage is sensed by the sensing divider resistors which compare output voltage with the +S reference voltage. This provides an error voltage at junction of R2 and R3, (or as applicable R1 and R3) which is amplified by error amplifier Q1 and Q2, (and as applicable, by voltage amplifier Q2), and is current amplified by driver Q5. The amplified signal from the driver controls the voltage across series regulator Q8, (and as applicable, Q9) which functions as the active regulating element, restoring output voltage to the proper level.

*Current limit circuit operation is determined by changes in the load. Current limit amplifier Q3 samples load current through current sensing resistor R14. When the voltage drop across R14 increases compared with the preset voltage reference determined by R17 and R18, (and CR4 and Q4 where applicable), Q3 conducts. Thus, when the output current rating of the unit is exceeded, current limit amplifier Q3 conducts decreasing the current through driver Q5, resulting in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R17.

+When operating conditions approach short circuit, the output voltage decreases. Since the voltage determined by R17 and R18 is proportional to the output voltage, when the output voltage decreases, Q3 is biased into turn-on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

+The following theory only applies for units with current sink Q4.

When operating conditions approach short circuit, and output voltage value decreases below the minimum voltage rating, current sink Q4 saturates and the divider R17, R18, Q4, R19 becomes purely resistive with no regulated reference for current limit operation. With Q4 in saturation the voltage reference becomes proportional to the output voltage, i.e., decreases as the output voltage decreases. This permits Q3 to turn on at lower and lower load currents until output voltage decreases to zero and current decreases to a predetermined low value.

*The following theory only applies for units with voltage amplifier Q2.

Current limit circuit operation is determined by changes in the load. When load current increases above the rated current value, the voltage drop across current limit potentiometer R17 increases, turning on current limit amplifier Q3. With Q3 conducting, the current to driver Q5 decreases, limiting the base current to series regulator Q8, Q9, which results in an increase of voltage across the series regulator and a decrease of the output voltage, effectively limiting the output current to a safe value. The current limit value is determined by the factory setting of current limit potentiometer R17.

When operating conditions reach short circuit, the output voltage value decreases to zero and the current decreases to a predetermined current limit value and remains unchanged.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating for each ambient temperature. *When load current exceeds 110% of 40°C rating, both voltage and current decrease until voltage reaches zero and the current at short circuit equals approximately 30 percent or less of the rated current.

*For models LMB-0-7, LMB-0-14, LMB-0-32, LMB-0-60 output current remains limited to 110% of 40°C current rating.

MOUNTING

When using this unit as a mounted component, a cutout must be provided to permit free-flow of air through the unit. See figure 9 for cutout sizes and specific mounting details.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagrams for all suggested output connections illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to terminals 1 and 2; always connect the ungrounded (hot) lead to terminal 1.

The supply positive terminal is brought out to terminal 6; the negative terminal to terminal 4.

NOTE: When shipped from the factory, the supply is ready for use as a local-sensing constant voltage source. Jumpers are connected at the factory as shown in figure 3. Take care to remove the appropriate jumpers for load requirements that need different supply-load connections. Refer to the appropriate connection diagram.

Supply-Load Connections. The regulation of the supply at the load may change when connecting leads of practical length are used. To minimize the effect of the output load leads, remote sensing is used. Refer to figure 1 to determine voltage drop for particular cable lengths, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Local-Sensing Connection, See Figure 3.

Remote-Sensing Connection, See Figure 4.

Programmed Voltage Connection Using External Resistor, See Figure 5. Discrete voltage steps can be programmed with a resistance voltage divider valued at nominal 200 ohms/volt output and a shorting-type switch. For continuous voltage variations, use a variable resistor with the same ohms/volt ratio in place of the voltage divider and shorting-type switch. Use low temperature coefficient resistor(s) to assure most stable operation.

Programmed Voltage Connection Using Programming Voltage, See Figure 6. The power supply voltage output can be programmed with an externally connected programming power supply. The output voltage of the programmed supply will maintain a one-to-one ratio with the voltage of the programming supply.

The programming supply must have a reverse current capability of 6 ma. minimum.

Alternatively, when supplies with less than 6 ma. reverse current capability are used, a resistor capable of drawing 6 ma. at the minimum programming voltage must be connected across the output terminals of the supply. This programming supply must be rated to handle all excess resistor current at the maximum programming voltage.

Operation After Thermostat Shutdown. The thermostat opens the input circuit only when the power supply output current exceeds the current rating specified for the operating ambient temperature, causing the unit to overheat. Do not exceed current rating specified for the operating ambient temperature. When the temperature of the unit decreases to a safe operating value, the thermostat will reset automatically.

Operation After Fuse Shutdown. Internal component failure is prevented by fuses which protect the components from damage caused by excessive currents. Fuses will blow when the maximum rated current value for the fuse is exceeded. Fatigue failure of fuses can occur when mechanical vibrations from the installation combine with thermally induced stresses to weaken the fuse metal. Many fuse failures are caused by a temporary condition and replacing the blown fuse will make the fuse protected circuit operative.

MAINTENANCE

GENERAL

This section describes trouble analysis routine, calibration and test procedures that are useful for servicing the Lambda power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on specifications and features for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check all fuses, primary power lines, external circuit elements, and external wiring for malfunction before troubleshooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumpers and supply-load connections or fuse failure due to metal fatigue.

Use the electrical schematic diagram and block diagram, figure 7, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are averages for normal no load operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING TRANSISTORS AND CAPACITORS

Check transistors with an in-circuit transistor checker. If no checker is available, transistors can be checked with an ohmmeter that has a highly limited current capability. Observe proper polarity for PNP or NPN to avoid error in measurement. The forward transistor resistance is low but never ZERO; backward resistance is always higher than the forward resistance.

Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional faulty components could damage the replaced component.

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers or a commercial heat sink device placed between the component and the solder joint.

> NOTE: The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. In all cases the capacitors are shunted with resistances, some of which have low values . Only a dead short is a true indication of a shorted capacitor.

PRINTED CIRCUIT BOARD MAINTENANCE TECHNIQUES

1. If foil is intact but not covered with solder it is a good contact. Do not attempt to cover with solder.

2. Voltage measurements can be made from either side of the board. Use a needle-point probe to penetrate to the wiring whenever a protective coating is used on the wiring. A brass probe can be soldered to an alligator clip adapted to measuring instrument.

3. Always use a heat sink when soldering transistors; a transistor pad with mounting feet is an effective heat sink.

4 Broken or damaged printed wiring is usually the result of an imperfection, strain or careless soldering. To repair small breaks, tin a short piece of hook-up wire to bridge

the break, and holding the wire in place, flow solder along the length of wire so that it becomes part of the circuitry.

5. When unsoldering components from the board never pry or force loose the part; unsolder the component by using the wicking process described below:

   (a) Select a 3/16 inch tinned copper braid for use as a wick; if braid is not available, select AWG No. 14 or No. 16 stranded wire with 1/2 inch insulation removed.

   (b) Dip the wick in liquid rosin flux.

   (c) Place the wick onto the soldered connection and apply soldering iron onto the wick.

   (d) When sufficient amount of solder flows onto the wick, freeing the component, simultaneously remove iron and wick.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes, and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

(a) AC power of proper voltage and frequency is present at input terminals.

(b) Either positive or negative terminal is connected to chassis ground.

(c) The power supply is connected for constant voltage with local sensing. See schematic; dotted lines indicate jumpers connected for local sensing operation.

TROUBLE CHART

Symptom	Probable Cause	Remedy
1. No output voltage	No power input, thermostat S1 open	Check power source, S1, line cord and line cord plug; shut off unit, allow to cool and check ambient temperature
	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections.
	Faulty Q2, CR1, CR6 (or Q3 for ZERO VOLT units)	Check Q2, CR1, CR6 (or Q3) for short and replace as required
2. Unable to adjust output voltage	Damaged VOLTAGE ADJUST control	Check R1 for shorts and/or open; replace as required
	Supply operating as constant current source at current limit value	Remove load, check load value and check for shorts and/or improper supply-load connections; refer to appropriate diagram for correct connections
3. Output voltage too high	Improper output terminal connection	Refer to appropriate connection diagram, and check for correct connections

TROUBLE CHART (cont'd)

Symptom	Probable Cause	Remedy
3. (Cont'd)	Faulty Q1, R1, Q8, (Q9 as req'd.), Q5 or CR1	Check R1 for open; Q8, (Q9), Q5, Q1 for short, CR1 for open and replace as required
4 Output voltage too low	Load resistance improper for unit ratings	Check load resistance value
	Faulty Q2, Q3, R14, R17 (or CR4 where used)	Check Q2, Q3 (or CR4) for short, R14, R17 for open, replace as required
5. High ripple and unregulated DC output	Load resistance improper for unit ratings	Check load resistance value
6. This step only for units with current sink Q4. Current limit value improper and varies directly with output voltage	Faulty Q4	Check Q4 for short and replace as required
7. High ripple	Improper ground	Connect terminal 6 or terminal 4 to ground terminal 5

PERFORMANCE CHECK

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 8. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

Set the differential meter, DC VTVM (John Fluke Model 825A or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the full load to no-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the VTVM differential meter.

Use a VTVM: Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use ocsilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

ADJUSTMENT OF CALIBRATION CONTROL R17

Whenever Q3, R14* or R17* (and Q4, and CR4 where used) are replaced, and voltage and current indications do not reflect maximum ratings, adjust R17 as follows:

*For models LMB-0-7, LMB-0-14, LMB-0-32, LMB-0-60, adjustment is required only when R14 or R17 is replaced. The adjustment procedure requires that the power supply is removed from associated equipment, is at an ambient temperature of 25-30^{O}C, and is stabilized and not operating.

1. Remove AC power input to the supply.

2. Unsolder wiper of R17 from resistor housing and turn to full CW position.

3. Operate power supply for constant voltage with local sensing, connected as shown in figure 3, with no external load.

4.** Turn voltage adjust control until minimum rated output voltage is obtained.

5.** Apply load so that output current is 110% of 40^{O}C rating for the unit.

6.** Using an oscilloscope, Tektronix 503 or equivalent, observe output voltage while adjusting R17 in a CCW direction. Adjust R17 until output ripple increases sharply and oscilloscope pattern changes.

7.** After adjustment is completed, remove AC power input to the supply and solder wiper of R17 to resistor housing.

8.** After soldering, check setting and repeat adjustment procedure if required.

** Perform alternate steps 4A through 9A for adjustment of R17 on models, LMB-0-7, 0-14, 0-32 and 0-60.

4A. Turn voltage adjust control until rated output voltage is obtained.

5A. Apply load so that output current is a maximum of 130% of 40^{O}C rating for the unit.

6A. Using an oscilloscope, Tektronix 503 or equivalent, observe unit output voltage while adjusting R17 in a CCW direction. Adjust R17 until output ripple increases sharply and oscilloscope pattern changes.

7A. Place a DC ammeter of appropriate scale across output terminals 4 and 6 of the supply. The meter indication shall be a maximum of 133% of 40^{O}C rating for the unit.

8A. After adjustment is completed, remove AC power input to the supply and solder wiper of R17 to resistor housing.

9A. After soldering, check setting and repeat adjustment procedure if required.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest Lambda office where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt of this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model and number and serial number of power supply and purchase date.
2. Lambda part number.
3. Description of part together with circuit designation.
4. If part is not an electronic part, or is not listed, provide a description, function, and location of the part.

PARTS LIST

The electrical parts located on all LM-B models are listed here. Parts common to a group of LM-B models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common-parts listing. In addition there are separate listings of parts for the metered panel (MP) option, the Y option and the overvoltage protection (OV) option, as applicable, for all LM models. The parts listed for models LMB-0-60 and LM-B60 do not utilize the common parts -- unique parts listings; all the parts for these models are sequentially listed under the applicable heading "PARTS FOR MODEL". Parts for the T option, V option and R option are included at the end of this listing.

MODELS LM-217 — LM-220

COMMON PARTS

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C1	Cap., mylar, 0.033 mfd ±10% 400 vdc	CGL-33-006
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003
C4	Cap., elect., 3 mfd -10 +75%, 100 vdc	CBN-30-015
C5	Cap., mylar, 0.10 mfd ±10%, 200 vdc	CGL-10-002
C7	Cap., elect., 140 mfd -10 +100%, 38 vdc	CBR-14-030
C12	Cap., mylar, 0.001 mfd ±5%, 200 vdc	CGK-10-004
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3	Same as CR2	
CR4	Rectifier, zener diode	FBM-Z102
CR5	Same as CR2	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q6, Q7	Not assigned	
R3	Res., ww, 1,200 ohms, ±3%, 2w	DFS-12-030
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180,000 ohms ±10%, 1/2w	DEB-1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 2,200 ohms ±10%, 1/2w	DEB-2221
R11	Res., comp., 22,000 ohms ±10%, 1/2w	DEB-2231
R12	Res., comp., 47 ohms ±10%, 1/2w	DEB-4701
R13*	Res., ww, 600 ohms ±3% 3w	DFR-60-005

MODELS LM-217 — LM-220 (Cont)

COMMON PARTS (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R15	Not assigned	
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2w	DNS-12-026
R18	Same as R7	
R22	Res., comp., 100 ohms ±10%, 1/2w	DEB-1011

* This part not used on units with "Y" option

UNIQUE PARTS

MODEL LM-217

C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR-16-039
C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C8	Cap., elect., 2,100 mfd -10 +100%, 35 vdc	CBS-21-043
C9	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C10	Same as C9	
C11	Not assigned	
CR8 Thru CR11	Not assigned	
CR13, CR14	Rectifier	FBL-00-092
Q4	Transistor, PNP,	FBN-L103
Q5	Transistor, NPN,	FBN-L109
Q8	Transistor, NPN	FBN-36485
R1	Res., var., ww, 2,200 ohms ±5%, 5w	DNS-22-053
R2	Res., ww, 1,200 ohms ±3%, 2w	DFS-12-030
R14	Res., ww, 0.39 ohms ±5%, 3w	DFM-39-043
R16	Res., comp., 1,800 ohms ±10%, 1/2w	DEB-1821
R19	Res., film, 1,800 ohms ±5%, 1/2w	DCS-18-013
R20	Res., comp., 15,000 ohms ±10%, 1/2w	DEB-1531
R21	Same as R19	
T1	Transformer	ABA-217

UNIQUE PARTS (Cont)

MODEL LM-218

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR-16-039
C6	Cap., mylar, 0.0033 mfd ±10%, 100 vdc	CGK-33-003
C8	Cap., elect., 2,100 mfd -10 +100%, 35 vdc	CBS-21-043
C9, C10	Not assigned	
C11	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
CR8 Thru CR11	Rectifier	FBL-00-047
Q4	Transistor, PNP,	FBN-L103
Q5	Transistor, NPN,	FBN-L109
Q8	Transistor, NPN	FBN-36220
R1	Res., var., ww, 4,500 ohms ±5%, 5w	DNS-45-059
R2	Res., ww, 2,200 ohms ±3%, 3w	DFS-20-032
R14	Res., ww, 0.56 ohms ±5%, 3w	DFM-56-042
R16	Res., comp., 1,800 ohms ±10%, 1/2w	DEB-1821
R19	Res., film, 4,700 ohms ±5%, 1/2w	DCS-47-003
R20	Res., comp., 47,000 ohms ±10%, 1/2w	DEB-4731
R21	Res., film, 2,400 ohms ±5%, 1/2w	DCS-24-001
T1	Transformer	ABA-218

MODEL LM-219

C3	Cap., elect., 90 mfd -10 +100%, 85 vdc	CBP-90-010
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C8	Cap., elect., 1,100 mfd -10 +100%, 60 vdc	CBS-11-042
C9, C10	Not assigned	
C11	Same as C6	
CR8 Thru CR11	Rectifier	FBL-00-036
Q4	Transistor, PNP	FBN-L103
Q5	Transistor, NPN	FBN-L108
Q8	Transistor, NPN	FBN-36487
R1	Res., var., ww, 4,500 ohms ±5%, 5w	DNS-45-059
R2	Res., ww, 3,000 ohms ±3%, 3w	DFS-30-021
R14	Res., ww, 0.56 ohms ±5%, 3w	DFM-56-042
R16	Res., comp., 1,800 ohms ±10%, 1/2w	DEB-1821
R19	Res., film, 10,000 ohms ±5%, 1/2w	DCT-10-008
R20	Res., comp., 120,000 ohms ±10%, 1/2w	DEB-1241
R21	Res., film, 4,700 ohms ±5%, 1/2w	DCS-47-003
T1	Transformer	ABA-219

UNIQUE PARTS (Cont)

MODEL LM-220

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C3	Cap., elect., 90 mfd -10 +100%, 85 vdc	CBP-90-010
C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C8	Cap., elect., 730 mfd -10 +100%, 85 vdc	CBR-73-029
C9, C10	Not assigned	
C11	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
CR8 Thru CR11	Rectifier	FBL-00-036
Q4	Transistor, PNP	FBN-L107
Q5	Transistor, NPN	FBN-L108
Q8	Transistor, NPN	FBN-35902
R1	Res., var., ww, 9,000 ohms ±5%, 5w	DNS-90-051
R2	Res., ww, 4,500 ohms ±3%, 3w	DFS-45-044
R14	Res., ww, 1.0 ohms ±3%, 3w	DFN-10-041
R16	Res., comp., 4,700 ohms ±10%, 1/2w	DEB-4721
R19	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R20	Res., comp., 180,000 ohms ±10%, 1/2w	DEB-1841
R21	Res., film, 10,000 ohms ±5%, 1/2w	DCT-10-008
T1	Transformer	ABA-220

COMMON PARTS

MODELS LM-B3 — LM-B5

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003
C3	Cap., elect., 500 mfd -10 +100% 20 vdc	CBR-50-037
C4	Cap., elect., 3.0 mfd -10 +75%, 100 vdc	CBN-30-015
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C6	Same as C5	
C7*	Cap., elect., 140 mfd -10% +100%, 38 vdc	CBR-14-030
C8	Cap., elect., 3,600 mfd -10% +100%, 20 vdc	CBS-36-044
C9	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C10	Same as C9	
C11	Not assigned	
C12	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3	Same as CR2	
CR4	Not assigned	
CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
CR8	Not assigned	

COMMON PARTS (Cont)

MODELS LM-B3 — LM-B5 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
CR9	Rectifier	FBL-00-092
CR10	Not assigned	
CR11	Same as CR9	
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q4	Not assigned	
Q5	Transistor, NPN	FBN-L113
Q6	Not assigned	
Q7	Not assigned	
Q8	Transistor, NPN	FBN-36972
R3	Res., ww, 1, 200 ohms ±3%, 2w	DFS-12-030
R4*	Res., film, 15, 000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180, 000 ohms ±10%, 1/2w	DEB-1841
R7	Res., film, 3, 900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4, 700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 2, 200 ohms ±10%, 1/2w	DEB-2221
R11	Res., comp., 22, 000 ohms ±10%, 1/2w	DEB-2231
R12	Res., comp., 47 ohms ±10%, 1/2w	DEB-4701
R13*	Res., ww, 600 ohms ±3%, 3w	DFR-60-005
R14	Res., ww, 0. 22 ohms ±5%, 5w	DFM-22-045
R15	Not assigned	
R16	Res., comp., 820 ohms ±10%, 1/2w	DEB-8211
R17	Res., var., ww, 1, 200 ohms ±10%, 1-1/2w	DNS-12-026
R19 Thru R21	Not assigned	
R22	Res., comp., 100 ohms ±10%, 1/2w	DEB-1011

* This part not used on units with "Y" option

UNIQUE PARTS

MODEL LM-B3

R1	Res., var., ww, 300 ohms ±5%, 5w	DNR-30-018
R2	Res., ww, 430 ohms, ± 3%, 3w	DFR-43-058
R18	Not assigned	
T1	Transformer	ABA-B3

UNIQUE PARTS

MODEL LM-B3P3

R1	Res., var., ww, 600 ohms, ± 5%, 5w	DNR-60-026
R2	Res., ww, 430 ohms, ± 3%, 3w	DFR-43-058
R18	Not assigned	
T1	Transformer	ABA-B4P5

UNIQUE PARTS (Cont)

MODEL LM-B3P6

R1	Res., var., wirewound, 600 ohms ±5%, 5w	DNR-60-026
R2	Res., wirewound, 430 ohms ±3% 3w	DFR-43-058
R18	Not assigned	
T1	Transformer	ABA-B4P5

MODEL LM-B4

R1	Res., var., wirewound, 600 ohms ±5%, 5w	DNR-60-026
R2	Res., wirewound, 600 ohms ±3% 3w	DFR-60-005
R18	Not assigned	
T1	Transformer	ABA-B4P5

MODEL LM-B4P5

R1	Res., var., wirewound, 600 ohms ±5%, 5w	DNR-60-026
R2	Res., wirewound, 650 ohms ±3%, 3w	DFR-65-062
R18	Res., film, 390 ohms ±5%, 1/2w	DCR-39-004
T1	Transformer	ABA-B4P5

MODEL LM-B5

R1	Res., var., wirewound, 600 ohms ±5%, 5w	DNR-60-026
R2	Res., wirewound, 650 ohms ±3%, 3w	DFR-65-062
R18	Res., film, 910 ohms ±5%, 1/2w	DCR-91-008
T1	Transformer	ABA-B5

MODELS LM-B6 — LM-B48

COMMON PARTS

C1	Cap., mylar, 0. 033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0. 22 mfd ±10%, 100 vdc	CGM-22-003
C4	Cap., elect., 3. 0 mfd -10 +75% 100 vdc	CBN-30-015
C5	Cap., mylar, 0. 01 mfd ±10%, 200 vdc	CGL-10-002
C7*	Cap., elect., 140 mfd -10% +100%, 38 vdc	CBR-14-030
C9	Not assigned	
C10	Not assigned	
C11	Cap., mylar, 0. 018 mfd ±10%, 200 vdc	CGL-18-005
C12	Cap., mylar, 0. 001 mfd ±10%, 200 vdc	CGK-10-004
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3	Same as CR2	
CR4	Not assigned	
CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q4	Not assigned	

COMMON PARTS (Cont)

MODELS LM-B6 — LM-B48 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
Q6	Not assigned	
Q7	Not assigned	
R3	Res., ww, 1,200 ohms, ±3%, 2w	DFS12-030
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR22-005
R6	Res., comp., 180,000 ohms ±10%, 1/2w	DEB1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB1511
R10	Res., comp., 2,200 ohms ±10%, 1/2w	DEB2221
R11	Res., comp., 22,000 ohms ± 10%, 1/2w	DEB2231
R12	Res., comp., 47 ohms ± 10%, 1/2w	DEB4701
R13*	Res., ww, 600 ohms ± 3%, 3w	DFR60-005
R15	Not assigned	
R17	Res., var., ww, 1,200 ohms ± 10%, 1-1/2w	DNS12-026
R19 Thru R21	Not assigned	
R22	Res., comp., 100 ohms ± 10% 1/2w	DEB1011

*This part not used on units with "Y" option

UNIQUE PARTS

MODEL LM-B6

C3	Cap., elect., 500 mfd -10 +100%, 20 vdc	CBR50-037
C6	Cap., mylar 0.01 mfd, ±10%, 200 vdc	CGL10-002
C8	Cap., elect., 3,600 mfd, -10 +100%, 20 vdc	CBS36-044
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN-36972
R1	Res., var., wirewound, 600 ohms, ±5%, 5w	DNR60-026
R2	Res., wirewound, 800 ohms, ±3%, 2w	DFR80-037
R14	Res., wirewound, 0.22 ohms, ±5%, 5w	DFM22-045
R16	Res., comp., 820 ohms, ±10%, 1/2w	DEB8211
R18	Res., film, 910 ohms, ±5%, 1/2w	DCR91-008
T1	Transformer	ABA-B6

MODEL LM-B8

C3	Cap., elect., 500 mfd -10 +100%, 20 vdc	CBR50-037
C6	Cap., mylar 0.01 mfd, ±10%, 200 vdc	CGL10-002

UNIQUE PARTS (Cont)

MODEL LM-B8 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C8	Cap., elect., 3,600 mfd, -10 +100%, 20 vdc	CBS36-044
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN36972
R1	Res., var., wirewound, 1,000 ohms, ±5%, 5w	DNS10-032
R2	Res., wirewound, 1,200 ohms, ±3%, 2w	DFS12-030
R14	Res., wirewound, 0.22 ohms, ±5%, 5w	DFM22-045
R16	Res., comp., 820 ohms, ±10%, 1/2w	DEB8211
R18	Res., film, 1,800 ohms, ±5%, 1/2w	DCS18-013
T1	Transformer	ABA-B8

MODEL LM-B10

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR28-038
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 2,100 mfd, -10 +100%, 35 vdc	CBS21-043
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN36972
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 1,200 ohms, ±3%, 2w	DFS12-030
R14	Res., wirewound, 0.22 ohms, ±5%, 5w	DFM22-045
R16	Res., comp., 1,500 ohms, ±10%, 1/2w	DEB1521
R18	Res., film, 1,800 ohms, ±5%, 1/2w	DCS18-013
T1	Transformer	ABA-B10

MODEL LM-B12

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR28-038
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 2,100 mfd, -10 +100%, 35 vdc	CBS21-043
CR8	Rectifier	FBL-00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN36972
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 1,800 ohms, ±3%, 3w	DFS18-048
R14	Res., wirewound, 0.22 ohms, ±5%, 5w	DFM22-045

UNIQUE PARTS (Cont)

MODEL LM-B12 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R16	Res., comp., 1,500 ohms, ±10%, 1/2w	DEB1521
R18	Res., film, 1,800 ohms, ±5%, 1/2w	DCS18-013
T1	Transformer	ABA-B12

MODEL LM-B15

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR28-038
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 2,100 mfd, -10 +100%, 35 vdc	CBS21-043
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN36485
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 1,800 ohms, ±3%, 3w	DFS18-048
R14	Res., wirewound, 0.39 ohms, ±5%, 3w	DFM39-043
R16	Res., comp., 2,700 ohms, ±10%, 1/2w	DEB2721
R18	Res., film, 1,800 ohms, ±5%, 1/2w	DCS18-013
T1	Transformer	ABA-B15

MODEL LM-B18

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR28-038
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 2,100 mfd, -10 +100%, 35 vdc	CBS21-043
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN36220
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 2,500 ohms, ±3%, 3w	DFS-25-036
R14	Res., wirewound, 0.39 ohms, ±5%, 3w	DFM39-043
R16	Res., comp., 2,700 ohms, ±10%, 1/2w	DEB2721
R18	Res., film, 6,800 ohms, ±5%, 1/2w	DCS68-021
T1	Transformer	ABA-B18

MODEL LM-B20

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR28-038
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 2,100 mfd, -10 +100%, 35 vdc	CBS21-043
CR8	Rectifier	FBL00-092
CR9 Thru CR11	Same as CR8	

UNIQUE PARTS (Cont)

MODEL LM-B20 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
Q5	Transistor, NPN	FBN-L109
Q8	Transistor, NPN	FBN36220
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 2,500 ohms, ±3%, 3w	DFS25-036
R14	Res., wirewound, 0.39 ohms, ±5%, 3w	DFM39-043
R16	Res., comp. 2,700 ohms, ±10%, 1/2w	DEB2721
R18	Res., film, 6,800 ohms, ±5%, 1/2w	DCS68-021
T1	Transformer	ABA-B20

MODEL LM-B24

C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR16-039
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 1,100 mfd, -10 +100%, 60 vdc	CBS11-042
CR8	Rectifier	FBL00-036
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L109
Q8	Transistor, NPN	FBN36220
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 3,600 ohms, ±3%, 3w	DFS36-050
R14	Res., wirewound, 0.56 ohms, ±5%, 3w	DFM56-042
R16	Res., comp., 2,700 ohms, ±10%, 1/2w	DEB2721
R18	Res., film, 6,800 ohms, ±5%, 1/2w	DCS68-021
T1	Transformer	ABA-B24

MODEL LM-B28

C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR16-039
C6	Cap., mylar, 0.0033 mfd, ±10%, 200 vdc	CGK33-003
C8	Cap., elect., 1,100 mfd, -10 +100%, 60 vdc	CBS11-042
CR8	Rectifier	FBL00-036
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L109
Q8	Transistor, NPN	FBN36487
R1	Res., var., wirewound, 2,200 ohms, ±5%, 5w	DNS22-053
R2	Res., wirewound, 4,500 ohms, ±3%, 3w	DFS45-044
R14	Res., wirewound, 0.56 ohms, ±5%, 3w	DFM56-042
R16	Res., comp., 3,900 ohms, ±10%, 1/2w	DEB3921
R18	Res., film, 6,800 ohms, ±5%, 1/2w	DCS68-021
T1	Transformer	ABA-B28

MODEL LM-B36

C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR16-039

UNIQUE PARTS (Cont)

MODEL LM-B36 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C6	Cap., mylar 0.0033 mfd, ±10%, 200 vdc	CGK-33-003
C8	Cap., elect., 1,100 mfd, -10 +100%, 60 vdc	CBS-11-042
CR8	Rectifier	FBL-00-036
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L108
Q8	Transistor, NPN	FBN-36487
R1	Res., var., wirewound, 3,300 ohms, ±5%, 5w	DNS-33-054
R2	Res., wirewound, 5,600 ohms, ±3%, 3w	DFS-56-053
R14	Res., wirewound, 0.56 ohms, ±5%, 3w	DFM-56-042
R16	Res., comp., 3,900 ohms, ±10%, 1/2w	DEB-3921
R18	Res., film, 10,000 ohms, ±5%, 1/2w	DCT-10-008
T1	Transformer	ABA-B36

MODEL LM-B48

C3	Cap., elect., 90 mfd -10 +100%, 85 vdc	CBP-90-010
C6	Cap., mylar 0.001 mfd, ±10%, 200 vdc	CGK-10-004
C8	Cap., elect., 400 mfd, -10 +100%, 100 vdc	CBR-40-044
CR8	Rectifier	FBL-00-036
CR9 Thru CR11	Same as CR8	
Q5	Transistor, NPN	FBN-L108
Q8	Transistor, NPN	FBN-36487
R1	Res., var., wirewound, 3,300 ohms, ±5%, 5w	DNS-33-054
R2	Res., wirewound, 8,000 ohms, ±3%, 3w	DFS-80-054
R14	Res., wirewound, 0.56 ohms, ±5% 3w	DFM-56-042
R16	Res., comp., 820 ohms, ±10%, 1/2w	DEB-8211
R18	Res., film, 10,000 ohms, ±5%, 1/2w	DCT-10-008
T1	Transformer	ABA-B48

MODELS LMB-0-7, B-0-14, B-0-32

COMMON PARTS

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003
C4	Cap., elect., 3.0 mfd -10 +75%, 100 vdc	CBN-30-015
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C7*	Cap., elect., 140 mfd -10 +100%, 38 vdc	CBR-14-030
C9	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C10	Same as C9	
C11 Thru C29	Not assigned	

COMMON PARTS (Cont)

MODELS LMB-0-7, B-0-14, B-0-32 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C30	Cap., mylar, 0.0068 mfd ±10%, 200 vdc	CGK-68-001
C31, C32	Not assigned	
C33	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3 Thru CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
CR8	Not assigned	
CR10	Not assigned	
CR12	Rectifier	FBL00-092
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q4	Not assigned	
Q6, Q7	Not assigned	
R2	Not assigned	
R3	Res., ww, 1,100 ohms ±3%, 2w	DFS-11-061
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180,000 ohms ±10%, 1/2w	DEB-1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 2,200 ohms ±10%, 1/2w	DEB-2221
R11, R12	Not assigned	
R13*	Res., ww, 600 ohms ±3%, 3w	DFR-60-005
R15	Not assigned	
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2w	DNS-12-026
R18, R19	Not assigned	
R22	Res., comp., 100 ohms ±10%, 1/2w	DEB-1011

*This component not used on units with "Y" option

UNIQUE PARTS

MODEL LMB-0-7

C3	Cap., elect., 500 mfd -10 +100%, 20 vdc	CBR-50-037
C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C8	Cap., elect., 3,600 mfd -10 +100%, 20 vdc	CBS-36-044
CR9	Rectifier	FBL00-092
CR11	Same as CR9	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN-36972
R1	Res., var., ww, 2,200 mfd ±5%, 5w	DNS22-053
R14	Res., ww, 0.39 ohms ±5%, 3w	DFM-39-043

UNIQUE PARTS (Cont)

MODEL LMB-0-7 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R16	Res., comp., 820 ohms ±10%, 1/2w	DEB-8211
R20	Res., comp., 820 ohms ±10%, 1w	DGB-8211
R21	Not assigned	
T1	Transformer	ABA-B5

MODEL LMB-0-14

C3	Cap., elect., 280 mfd -10 +100%, 35 vdc	CBR-28-038
C6	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C8	Cap., elect., 2,100 mfd -10 +100%, 35 vdc	CBS-21-043
CR9	Rectifier	FBL-00-092
CR11	Same as CR9	
Q5	Transistor, NPN	FBN-L113
Q8	Transistor, NPN	FBN-36972
R1	Res., var., ww, 3,300 ohms ±5%, 5w	DNS-33-054
R14	Res., ww, 0.56 ohm ±5%, 3w	DFM-56-042
R16	Res., comp., 820 ohms ±10%, 1/2w	DEB-8211
R20	Res., comp., 820 ohms ±10%, 1w	DGB-8211
R21	Not assigned	
T1	Transformer	ABA-B014

MODEL LMB-0-32

C3	Cap., elect., 160 mfd -10 +100%, 60 vdc	CBR-16-039
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C8	Cap., elect., 100 mfd -10 +100%, 60 vdc	CBS-11-042
CR9	Rectifier	FBL-00-036
CR11	Same as CR9	
Q5	Transistor, NPN	FBN-L109
Q8	Transistor, NPN	FBN-36487
R1	Res., var., ww, 9,000 ohms ±5%, 5w	DNS-90-051
R14	Res., ww, 1.0 ohms ±3%, 3w	DFN-10-041
R16	Res., comp., 1,000 ohms ±10%, 1/2w	DEB-1021
R20	Res., ww, 2,000 ohms ±5%, 3w	DFS-20-038
R21	Same as R20	
T1	Transformer	ABA-B032

MODELS LM-B100, LM-B120, LM-B150

COMMON PARTS

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0.15 mfd ±10%, 200 vdc	CGM-15-005
C3	Cap., elect., 25 mfd -10% +100%, 250 vdc	CBP-25-016
C4	Cap., elect., 3.5 mfd -10% +100%, 300 vdc	CBN-35-018
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002

MODELS LM-B100, LM-B120, LM-B150 (Cont)

COMMON PARTS (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C6	Same as C5	
C7*	Cap., elect., 140 mfd, -10% +100%, 38 vdc	CBR-14-030
C8	Cap., elect., 200 mfd -10% +100%, 250 vdc	CBR-20-045
C9	Not assigned	
C10	Not assigned	
C11	Same as C1	
C12 Thru C29	Not assigned	
C30	Cap., mylar, 0.0033 mfd ±10%, 200 vdc	CGK-33-003
C31	Not assigned	
C32	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004
C33	Same as C32	
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3	Same as CR2	
CR4, CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
CR12	Rectifier	FBL-00-033
Q1	Transistor, NPN	FBN-L110
Q2, Q3	Same as Q1	
Q4	Not assigned	
Q6, Q7	Not assigned	
Q8	Transistor, NPN	FBN-L147
Q9	Same as Q8	
R1	Res., var., ww, 9,000 ohms ±5%, 5w	DNS-90-051
R3	Res., ww, 1,200 ohms, ±3%, 2w	DFS-12-030
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180,000 ohms ±10%, 1/2w	DEB-1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 3,900 ohms ±10%, 1/2w	DEB-3921
R11	Res., comp., 22,000 ohms, ±10%, 1/2w	DEB-2231
R12	Res., comp., 47 ohms, ±10%, 1/2w	DEB-4701
R13*	Res., ww, 600 ohms ±3%, 3w	DFR-60-005
R14	Res., ww, 6.0 ohms ±3%, 3w	DFN-60-054
R15	Same as R14	
R16	Res., comp., 1,800 ohms ±10%, 1/4w	DCB-1821
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2w	DNS-12-026
R19 Thru R21	Not assigned	

*This part not used on units with "Y" option.

COMMON PARTS (Cont)

MODELS LM-B100, LM-B120, LM-B150 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R22	Res., comp., 220 ohms ±10%, 1/2w	DEB-2211

*This component not used on units with "Y" option

UNIQUE PARTS

MODEL LM-B100

CR8 Thru CR11	Rectifier	FBL-00-033
Q5	Transistor, NPN	FBN-L108
R2	Res., ww, 16,000 ohms ±3%, 5w	DFT-16-039
R18	Res., film, 39,000 ohms ±5%, 1/2w	DCT-39-015
T1	Transformer	ABA-B100

MODEL LM-B120

CR8 Thru CR11	Rectifier	FBL-00-033
Q5	Transistor, NPN	FBN-L108
R2	Res., ww, 20,000 ohms, ±3%, 5w	DFT-20-040
R18	Res., film, 43,000 ohms ±5%, 1/2w	DCT-43-016
T1	Transformer	ABA-B120

MODEL LM-B150

CR8 Thru CR11	Rectifier	FBL-00-064
Q5	Transistor, NPN	FBN-L115
R2	Res., ww, 26,000 ohms ±3%, 5w	DFT-26-041
R18	Res., film, 56,000 ohms ±5%, 1w	DCT-56-017
T1	Transformer	ABA-B150

PARTS FOR MODEL LMB-0-60

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003
C3	Cap., elect., 90 mfd -10 +100%, 85 vdc	CBP-90-010
C4	Cap., elect., 3.0 mfd -10 +75%, 100 vdc	CBN-30-015
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C7*	Cap., elect., 140 mfd -10 +100%, 38 vdc	CBR-14-030
C8	Cap., elect., 400 mfd -10 +100%, 100 vdc	CBR-40-044
C9, C10	Not assigned	
C11	Same as C6	
C12 Thru C29	Not assigned	
C30	Cap., mylar, 0.0068 mfd ±10%, 200 vdc	CGK-68-001
C31, C32	Not assigned	

PARTS FOR MODEL LMB-0-60 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C33	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3 Thru CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
CR8 Thru CR11	Rectifier	FBL-00-036
CR12 Thru CR15	Same as CR2	
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q4	Not assigned	
Q5	Transistor, NPN	FBN-L108
Q6, Q7	Not assigned	
Q8	Transistor, NPN	FBN-35902
R1	Res., var., ww, 13,000 ohms ±5%, 5w	DNT-13-031
R2	Not assigned	
R3	Res., ww, 1,100 ohms ±3%, 2w	DFS-11-061
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180,000 ohms ±10%, 1/2w	DEB-1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 2,200 ohms ±10%, 1/2w	DEB-2221
R11, R12	Not assigned	
R13*	Res., ww, 600 ohms ±3%, 3w	DFR-60-005
R14	Res., ww, 1.5 ohms ±3%, 3w	DFN-15-042
R15	Not assigned	
R16	Res., comp., 1,000 ohms ±10%, 1/2w	DEB-1021
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2w	DNS-12-026
R18	Not assigned	
R19	Not assigned	
R20	Res., ww, 4,500 ohms ±5%, 3w	DFS-45-044
R21	Same as R20	
R22	Res., comp., 100 ohms ±10%, 1/2w	DEB-1011
T1	Transformer	ABA-B60

*This component not used on units with "Y" option

PARTS FOR MODEL LM-B60

C1	Cap., mylar, 0.033 mfd ±10%, 400 vdc	CGL-33-006
C2	Cap., mylar, 0.22 mfd ±10%, 100 vdc	CGM-22-003

PARTS FOR MODEL LM-B60 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
C3	Cap., elect., 90 mfd -10 +100%, 85 vdc	CBP-90-010
C4	Cap., elect., 3.0 mfd -10 +75%, 100 vdc	CBN-30-015
C5	Cap., mylar, 0.01 mfd ±10%, 200 vdc	CGL-10-002
C6	Cap., mylar, 0.018 mfd ±10%, 200 vdc	CGL-18-005
C7*	Cap., elect., 140 mfd -10 +100%, 38 vdc	CBR-14-030
C8	Cap., elect., 400 mfd -10 +100%, 100 vdc	CBR-40-044
C9	Not assigned	
C10	Not assigned	
C11	Same as C6	
C12	Cap., mylar, 0.001 mfd ±10%, 200 vdc	CGK-10-004
C13 - C29	Not assigned	
C30	Cap., mylar, 0.0033 mfd ±10%, 200 vdc	CGK-33-003
CR1*	Rectifier, zener diode	FBM-Z104
CR2	Rectifier	FBL-00-030
CR3	Same as CR2	
CR4	Not assigned	
CR5	Not assigned	
CR6	Rectifier, zener diode	FBM-Z103
CR7	Same as CR2	
CR8	Rectifier	FBL-00-036
CR9 Thru CR11	Same as CR8	
Q1	Transistor, NPN	FBN-L110
Q2	Same as Q1	
Q3	Same as Q1	
Q4	Not assigned	
Q5	Transistor, NPN	FBN-L108
Q6	Not assigned	
Q7	Not assigned	
Q8	Transistor, NPN	FBN-35902
R1	Res., var., ww, 4,500 ohms ±5%, 5w	DNS-45-059
R2	Res., ww, 10,000 ohms ±3%, 5w	DFT-10-042
R3	Res., ww, 1,200 ohms ±3%, 2w	DFS-12-030
R4*	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R5	Res., film, 220 ohms ±2%, 1/2w	DCR-22-005
R6	Res., comp., 180,000 ±10%, 1/2w	DEB-1841
R7	Res., film, 3,900 ohms ±5%, 1/2w	DCS-39-014
R8	Res., comp., 4,700 ohms ±10%, 1/4w	DCB-4721
R9	Res., comp., 150 ohms ±10%, 1/4w	DCB-1511
R10	Res., comp., 3,900 ohms ±10%, 1/2w	DEB-3921
R11	Res., comp., 22,000 ohms ±10%, 1/2w	DEB-2231
R12	Res., comp., 47 ohms ±10%, 1/2w	DEB-4701
R13*	Res., ww, 600 ohms ±3%, 3w	DFR-60-005
R14	Res., ww, 1.0 ohms ±3%, 3w	DFN-10-014
R15	Not assigned	

PARTS FOR MODEL LM-B60 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R16	Res., comp., 1,000 ohms ±10%, 1/2w	DEB-1021
R17	Res., var., ww, 1,200 ohms ±10%, 1-1/2w	DNS-12-026
R18	Res., film, 15,000 ohms ±2%, 1/2w	DCT-15-013
R19 Thru R21	Not assigned	
R22	Res., comp., 100 ohms ±10%, 1/2w	DEB-1011
T1	Transistor	ABA-B60

*This component not used on units with "Y" option

PARTS FOR "MP" OPTION
MODELS MP-3, MP-5, P-3, P-5

DS1	Pilot light assembly, ALL	HRD 00-007
F1	Fuse, 3 AG, "SLO-BLO", 1.5 amperes, LM-217 thru LM-220, LM-B0-7 thru B0-60	FFC 01-500
F1	Fuse, 3 AG, "SLO-BLO", 2.0 amperes, LM-B3 thru LM-B150	FFC 02-000
XF1	Fuseholder, ALL	HRK 00-007
M1*	Meter, volts, D.C., 0-5 vdc, LM-B3 thru LM-B4P5	EBN 50-003
M1*	Meter, volts D.C., 0-8 vdc. LM-B5, LM-B6, LMB-0-7	EBN 80-005
M1*	Meter, volts D.C., 0-10 vdc, LM-B8	EBP 10-016
M1*	Meter, volts, D.C., 0-15 vdc, LM217, LM-B10, LM-B12, LMB-0-14	EBP 15-017
M1*	Meter, volts, D.C., 0-20 vdc, LM-B15, LM-B18	EBP 20-014
M1*	Meter, volts, D.C., 0-25 vdc, LM-218, LM-B20	EBP 25-018
M1*	Meter, volts, D.C., 0-40 vdc, LM-219, LM-B24, B28, B36, LMB-0-32	EBP 40-013
M1*	Meter, volts, D.C., 0-60 vdc, LM220, LM-B48, LMB-0-60	EBP 60-015
M2*	Meter, amperes, D.C., 0-5 amperes, LM-B3 thru LM-B8	EDN 50-021
M2*	Meter, amperes, D.C., 0-3 amperes, LM-217, LM-B10, B12, B15, LMB-0-7	EDN 30-019
M2*	Meter, amperes, D.C., 0-2 amperes, LM-B18, LM-B20, LMB-0-14	EDN 20-022
M2*	Meter, amperes, D.C., 0-1.5 ampere, LM-218, 219, LM-B24, B28, B36	EDN 15-020
M2*	Meter, amperes, D.C., 0-1 ampere, LM-220, LM-B48, LMB-0-32, LM-B60	EDN 10-014
R1	Res., var., ww, 2,200 ohms ±5%, 5w, LM-217, LM-B10 thru LM-B28, LMB-0-7	DNS-22-053

PARTS FOR "MP" OPTION (Cont)
MODELS MP-3, MP-5, P-3, P-5 (Cont)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.
R1	Res., var., ww, 4,500 ohms ±5%, 5w, LM-218, LM-219, LM-B60	DNS-45-049
R1	Res., var., ww, 9,000 ohms ±5%, 5w, LM-220, LMB-0-32, LM-B100 thru B150	DNS-90-051
R1	Res., var., ww, 300 ohms ±5%, 5w, LM-B3	DNR 30-018
R1	Res., var., ww, 600 ohms ±5%, 5w, LM-B3P3 thru LM-B6	DNR-60-026
R1	Res., var., ww, 1,000 ohms ±5%, 5w, LM-B8	DNS 10-032
R1	Res., var., ww, 3,300 ohms ±5%, 5w, LM-B36, LM-B48, LMB-0-14	DNS-33-054
S1**	Switch, SPST, ALL	FDA 11-001
S1+	Switch, SPST, ALL	FDA 11-022
C1, C2	Cap., tant., 2.5 mfd -15 +75%, 100 vdc, ALL	CBN-25-010
M1*	Meter, volts, D.C., 0-80 vdc, LM-B60	EBP-80-019
M1*	Meter, volts, D.C., 0-120 vdc, LM-B100	EBR-12-075
M1*	Meter, volts, D.C., 0-150 vdc, LM-B120	EBR-15-076
M1*	Meter, volts, D.C., 0-200 vdc, LM-B150	EBR-20-077
M2*	Meter, amperes, D.C., 0-0.3 amperes, LM-B120, LM-B150	EDM-30-035
M2*	Meter, amperes, D.C., 0-0.5 amperes, LM-B100, LMB-0-60	EDM-50-034
R1	Res., var., ww, 13,000 ohms ±5%, 5w, LMB-0-60	DNT-13-031

*This part only used on MP-3, MP-5
**This part only used on MP-3, P-3
+This part only used on MP-5, P-5

PARTS FOR "OV" OPTION
MODELS LMOV-1, LMOV-2, LMOV-3
COMMON PARTS

C1	Cap., mylar, 0.01 mfd ±20%, 80 vdc	CGL-10-008
Q1	Transistor, NPN	FBN-L102
R3	Res., film, 200 ohms ±5%, 1/2w	DCR-20-010
R4	Res., thermistor, 425 ohms ±5%, 1-1/4w	DKR-43-004
R5	Res., comp., 1,200 ohms ±10%, 1/2w	DEB-1221
R6	Same as R5	
R8	Res., comp., 15,000 ohms ±10%, 1/2w	DEB-1531
R10	Same as R5	
SCR1	Rectifier, silicon, controlled	FBP-00-009

UNIQUE PARTS

MODEL LMOV-1

Q2	Transistor, PNP	FBN-L103
R1	Res., var., ww or cermet, 2,000 ohms ±10%, 3/4w	DNS-20-034
R2	Res., film, 560 ohms ±2%, 1/2w	DCR-56-002
R7	Res., comp., 33 ohms ±5%, 1/4w	DCB-3305
R9	Not assigned	

UNIQUE PARTS (CONT.)

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.

MODEL LMOV-2

Q2	Transistor, PNP	FBN-L103
R1	Res., var., ww or cermet, 5,000 ohms ±10%, 3/4w	DNS-50-036
R2	Res., film, 1,470 ohms ±1%, 1/2w	DCS-15-031
R7	Res., comp., 33 ohms ±5%, 1/4w	DCB-3305
R9	Not assigned	

MODEL LMOV-3

Q2	Transistor, PNP	FBN-L114
R1	Res., var., ww or cermet, 20,000 ohms ±10%, 3/4w	DNT-20-010
R2	Res., film, 4,700 ohms ±2%, 1/2w	DCS-47-028
R7	Res., comp., 39 ohms ±5%, 1/4w	DCB-3905
R9	Res., comp., 22 ohms ±10%, 1/2w	DEB-2201

PARTS FOR "Y" OPTION

C107	Cap., elect., 40 mfd, 35 vdc	CBP-40-014
CR1	Rectifier, zener diode	FBM-Z107
CR101	Rectifier, zener diode	FBM-Z104
Q101	Transistor, NPN	FBN-L109
R4	Res., comp., 220,000 ohms ±10%, 1/2w	DEB-2241
R101	Res., film, 6,800 ohms ±2%, 1/4w	DCS-68-032
R102	Res., film, 220 ohms ±2%, 1/4w	DCR-22-014

PARTS FOR "T" OPTION

All "B" Package Models except FI changes on LM-B8 thru LM-B150 and LM-220
The following parts change and a resistor is added in series to DS-1 of "MP" option.

C1	Cap., mylar, 0.033 mfd ±10%, 600 vdc	CGL-33-014
F1	Fuse, "Slo-Blo" 0.75 amps 250 v	FFG-00-750
T1	Transformer	Add suffix "T" to reg. T1 No.
DS1-Res.	Res., comp., 120 K ±10%	DEB-1241

MODELS LM-B8 THRU LM-B150 AND LM-220

All changes and additions apply except F1 is;

F1	Fuse, "Slo-Blo", 1.0 amps 250 v	FFG-01-000

PARTS FOR "R" OPTION

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.

Transformer T1 changes on all "B" package models with suffix "R". For transformer T1 used on these models see standard "B" model parts lists for the standard transformer part no. and add suffix "R" to the part no.

PARTS FOR V OPTION

All "B" Package Models with the "V" Option have the same part changes as listed for the "T" Option except for capacitor C1 and transformer T1 listed below.

C1	Cap., paper, 0.01 mf ±10%, 1000 vdc	CAL-10-021
T1	Transformer	Add suffix "G" * to reg. T1 No.

*Suffix "V" on units with serial no. prefixes A-E

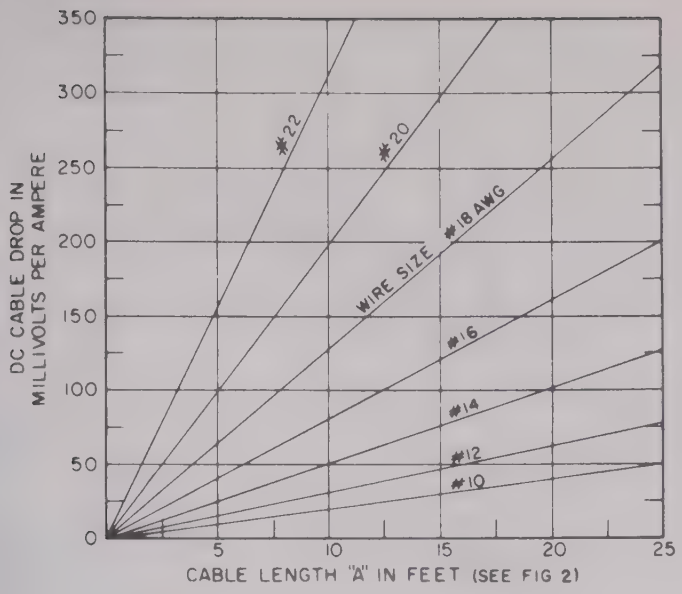


Figure 1. Cable Connection Chart

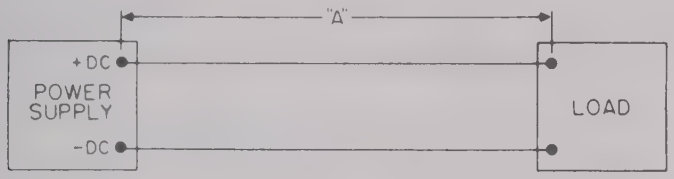
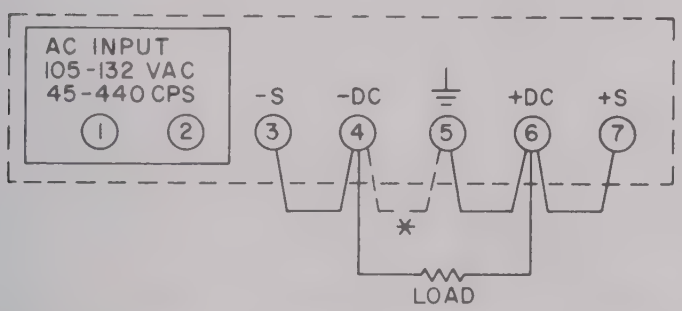
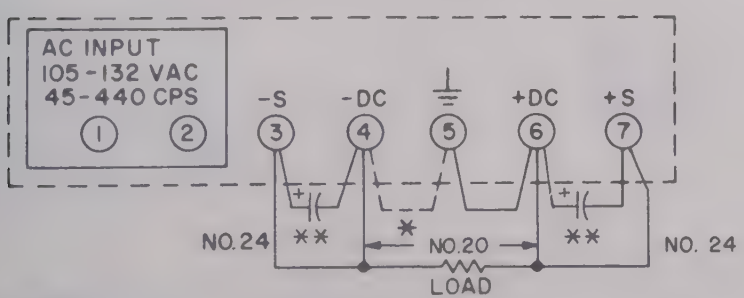


Figure 2. Cable Length "A" in Feet



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.

Figure 3. Local Sensing Connections



NOTE:
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS 5 AND 6 AND RECONNECT TO TERMINALS 4 AND 5.
** A 2.5 MF, ELECT., CAP. MAY BE REQUIRED.

Figure 4. Remote Sensing Connections

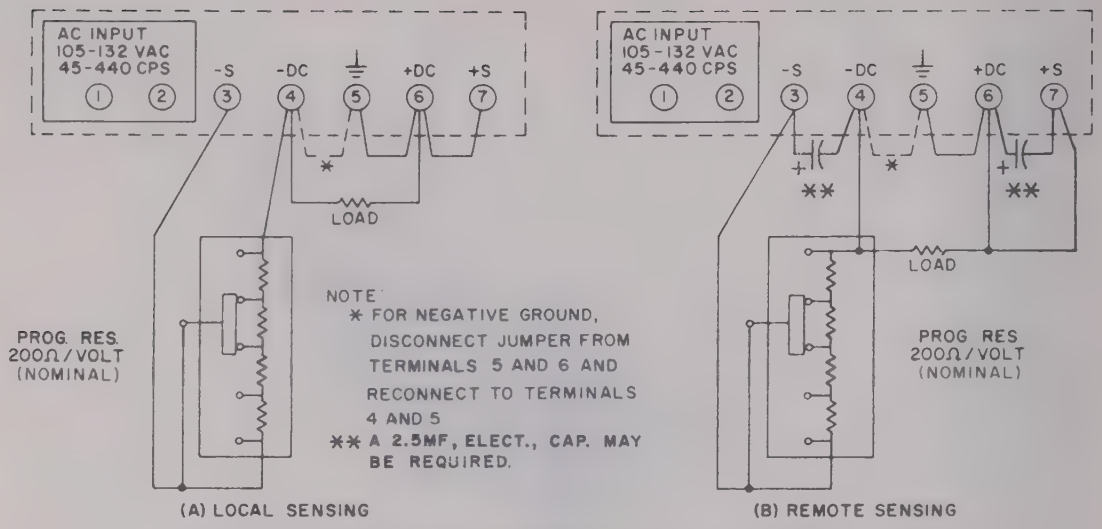


Figure 5. Programmed Voltage, with External Resistor

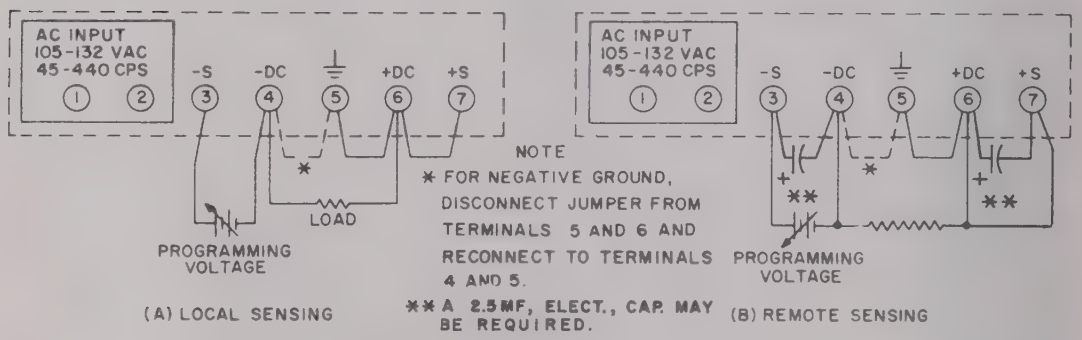


Figure 6. Programmed Voltage, with External Programming Voltage Source

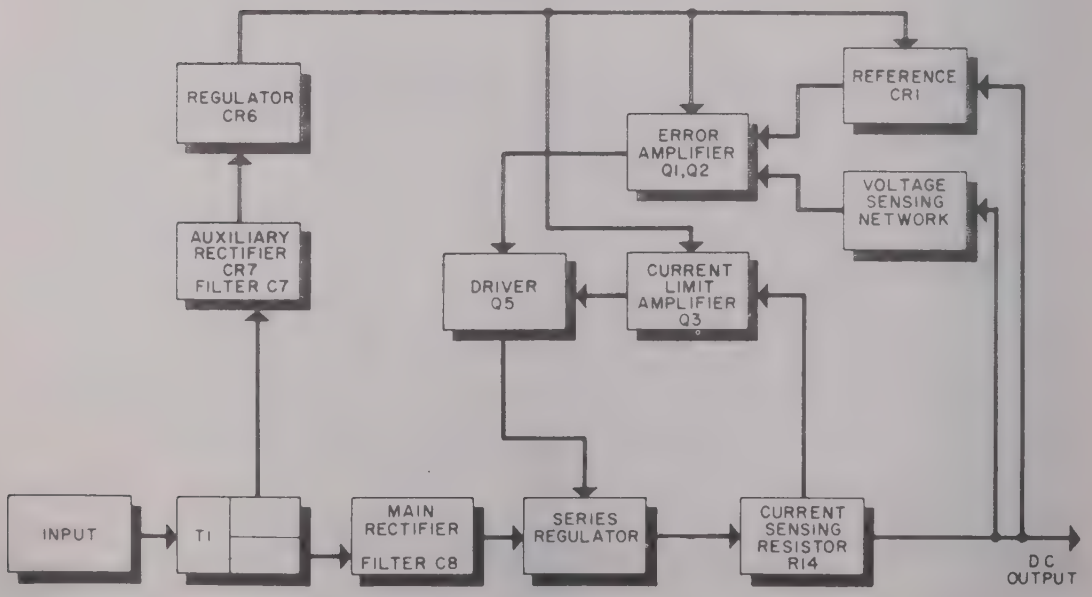


Figure 7. Typical Block Diagram

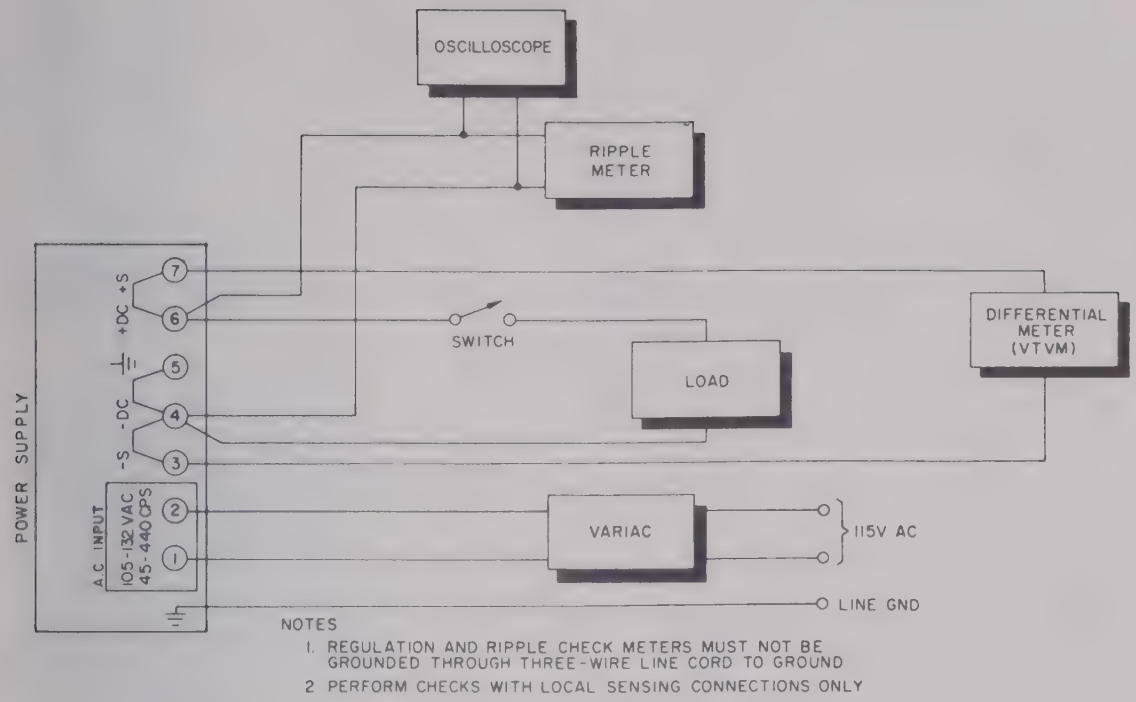


Figure 8. Test Connections for Performance Checks

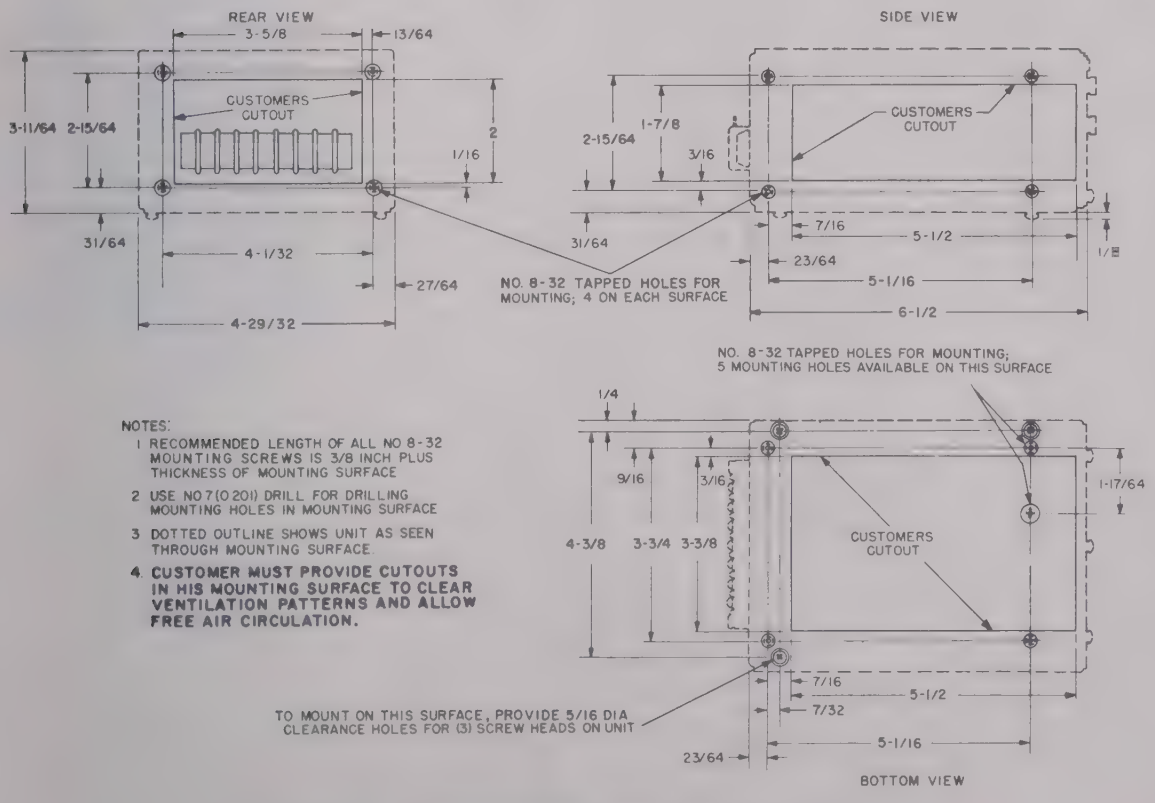
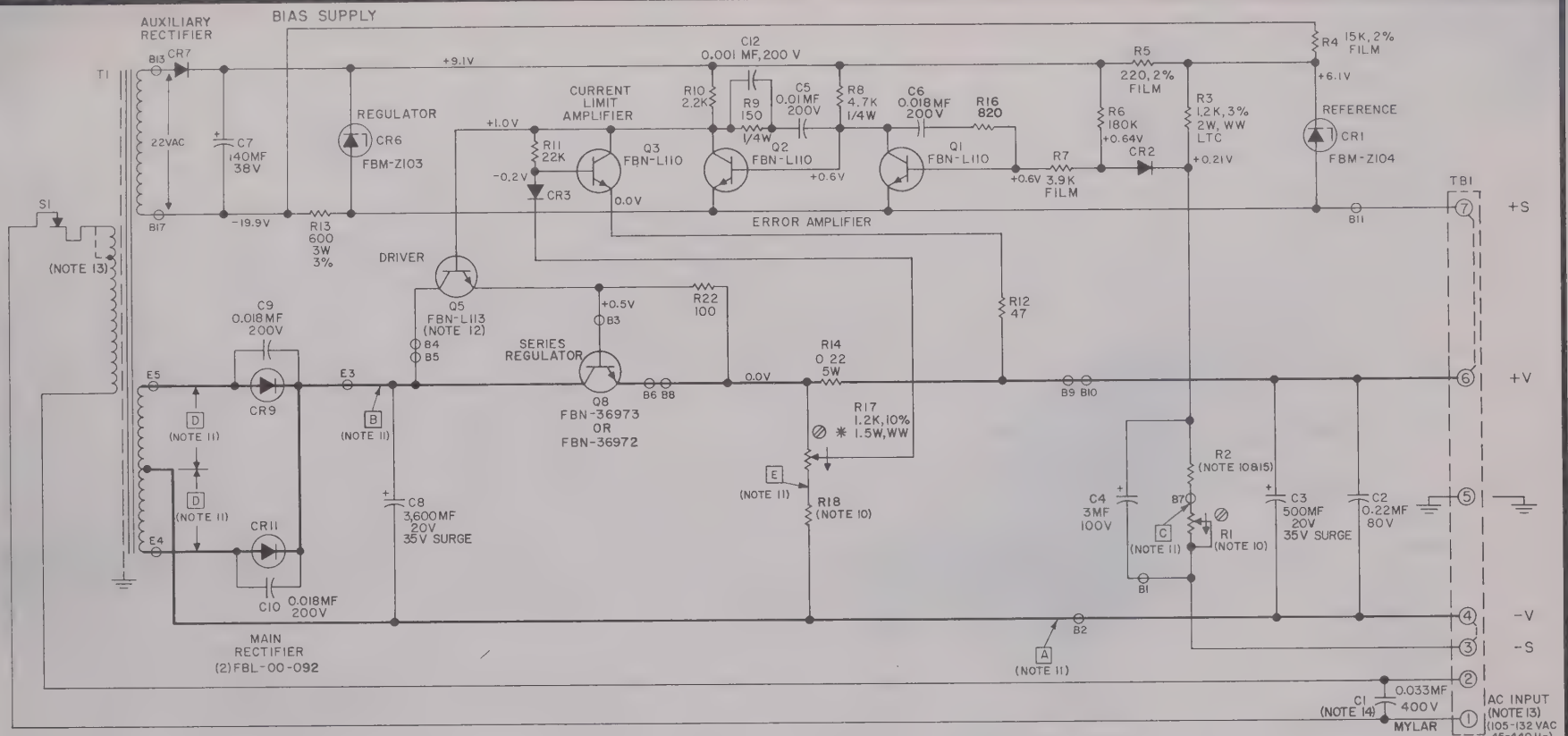


Figure 9. Recommended Mounting Cutouts

SCB-83-5A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B" OR TERMINAL BOARD "E"
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60 Hz. OUTPUT: NOM'L VDC, NO LOAD INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
13. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
14. ON UNITS WITH "V" OPTION, C1 IS 0.01MF±10%, 1000V, PAPER.
15. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	C11
Q7	R15
Q4	R19-R21
CR4,5	
CR8	
CR10	

MODELS
LM-B3P3
LM-B3
LM-B4
LM-B4P5
LM-B5
LM-B3P6

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

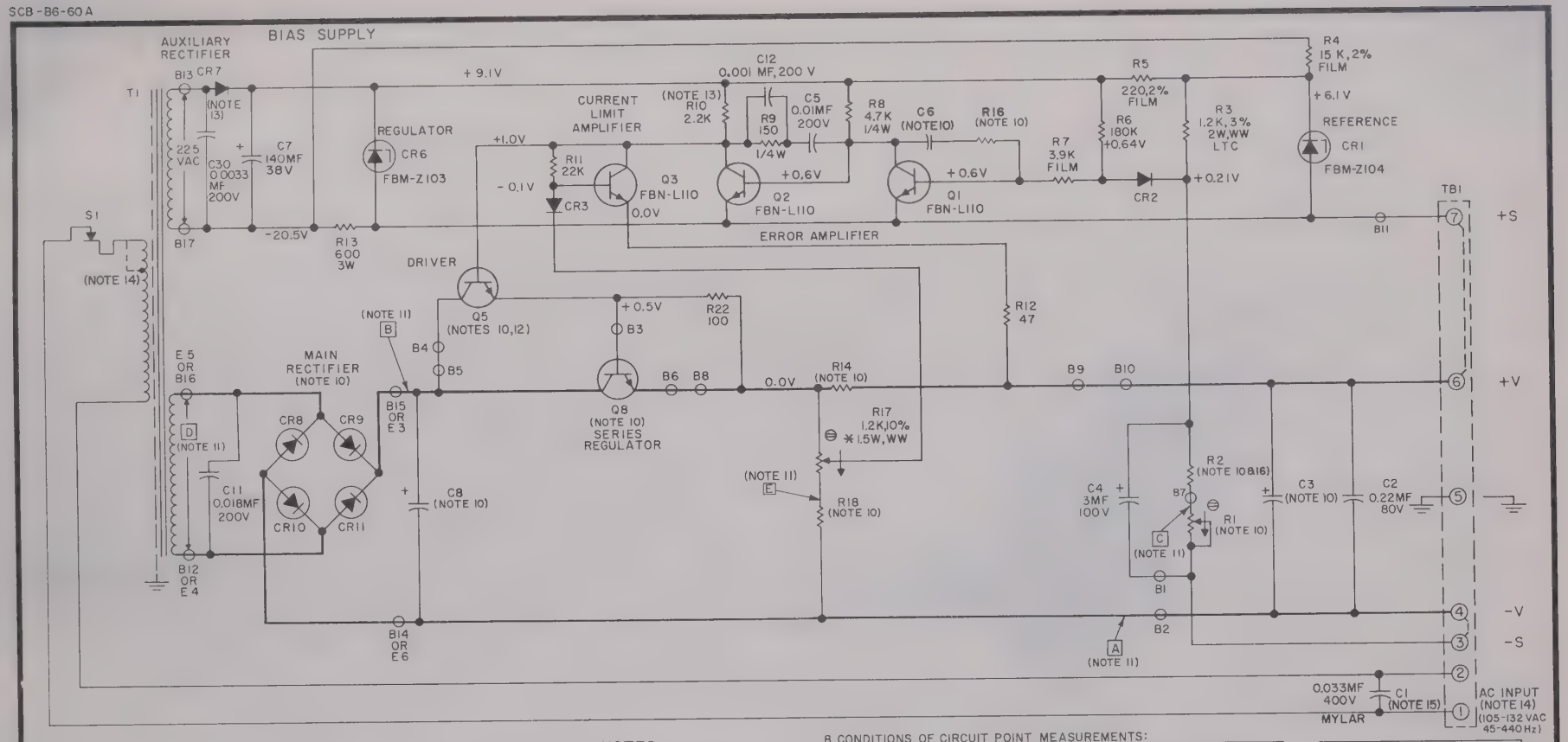
LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

TABLE I

DATA REFERENCES FOR MODELS LM-B3 — LM-B5

Model	Voltage Range (VDC)	Max. Current (Amperes)				Schematic Voltage Measurement					Schematic Components		
											R1	R2	R18
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	E (VDC)	±5% 5W	±3% 3W	±5% 1/2W
LM-B3	3.0±5%	3.8	3.3	2.6	1.6	-3.0	+13.9	-2.00	11.9	-3.0	300	430	JUMPER
LM-B3P3	3.3±5%	3.8	3.3	2.6	1.6	-3.3	+15.4	-2.2	13.2	-3.3	600	430	JUMPER
LM-B3P6	3.6±5%	3.8	3.3	2.6	1.6	-3.6	+15.1	-2.2	13.2	-3.6	600	430	JUMPER
LM-B4	4.0±5%	3.8	3.3	2.6	1.6	-4.0	+14.3	-2.00	12.9	-4.0	600	600	JUMPER
LM-B4P5	4.5±5%	3.7	3.2	2.5	1.5	-4.5	+14.2	-2.80	13.2	-3.4	600	650	390
LM-B5	5.0±5%	3.7	3.2	2.5	1.5	-5.0	+13.7	-2.80	13.2	-2.8	600	650	910

SCB-B6-60A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%, +100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B" OR TERMINAL BOARD "E".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55Hz, FOR 360-440Hz CONSULT FACTORY.
8. CONDITIONS OF CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 Hz ; OUTPUT: NOM'L VDC, NO LOAD INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
13. FOR MODEL LM-B60 ONLY, R10 IS 3.9 K ; C30 IS ADDED.
14. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
15. ON UNITS WITH "V" OPTION, C1 IS 0.01MF ±10%, 1000V, PAPER.
16. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	C9
Q7	C10
Q4	
R15	
R19-R21	
CR4,5	

MODELS	MODELS
LM-B6	LM-B18
LM-B8	LM-B20
LM-B60	LM-B24
LM-B10	LM-B28
LM-B12	LM-B36
LM-B15	LM-B48

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

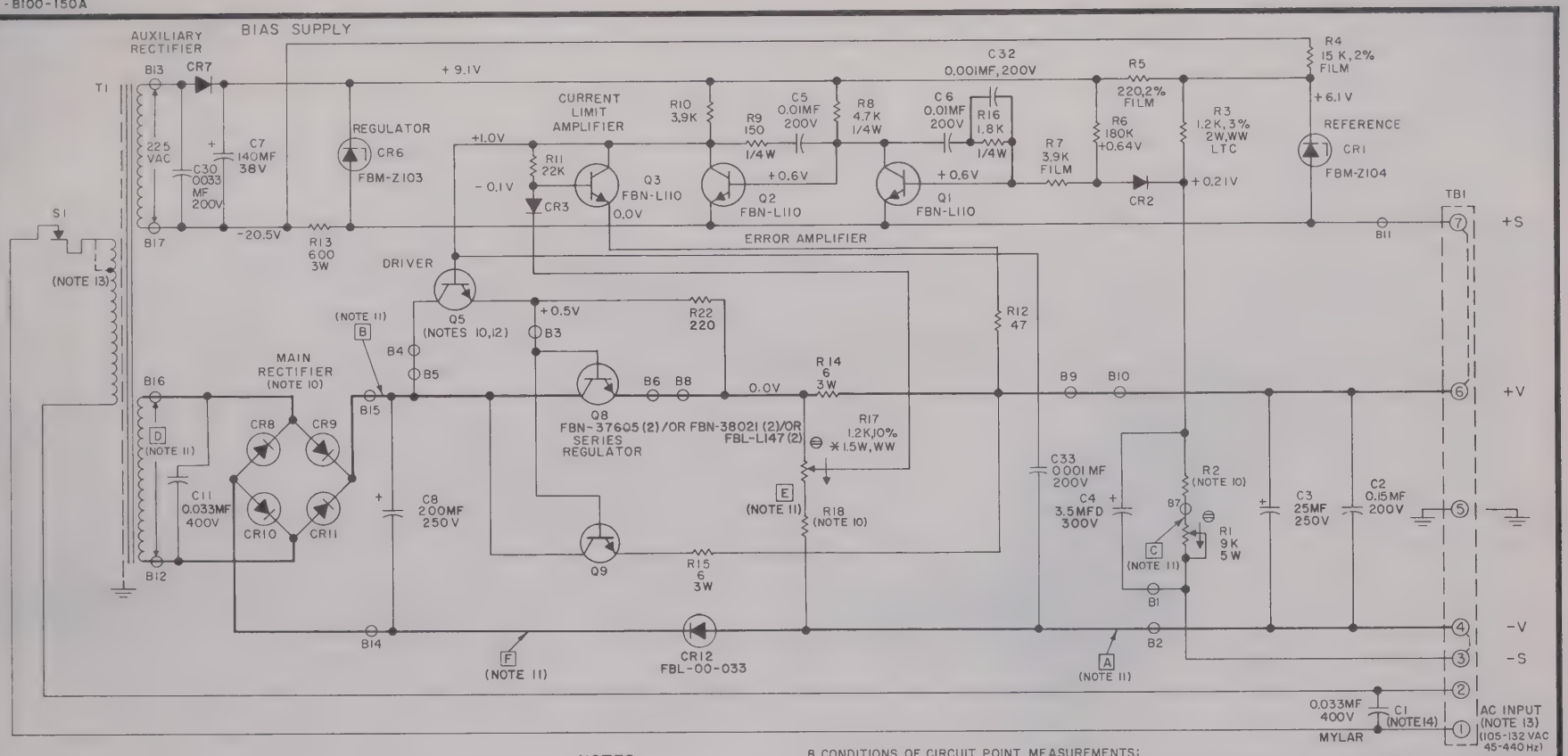
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

TABLE I

DATA REFERENCES FOR MODELS LM-B6 — LM-B60

Model	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltage Measurement					Schematic Components										
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	E (VDC)	C3	C6	C8	CR8-11 (FBL 00-)	Q5 (FBN-)	Q8 (FBN-)	R1 ±5% 5W	R2 ±3% 3W	R14	R16 ±10% 1/2W	R18 ±5% 1/2W
LM-B6	6±5%	3.2	2.9	2.4	1.4	-6.0	+14.3	-3.8	14.3	-3.4	500MF, 20V 35V SURGE	0.01 MF, 200V	3,600MF, 20V 35V SURGE	092	L113	36972	600	800 2W	0.22 ±5%, 5W	820	910
LM-B8	8±5%	3.2	2.9	2.4	1.4	-8.0	+15.7	-5.8	16.8	-3.2	500MF, 20V 35V SURGE	0.01 MF, 200V	3,600MF, 20V 35V SURGE	092	L113	36972	1.0K	1.2K 2W	0.22 ±5%,5W	820	1.8K
LM-B10	10±5%	2.7	2.5	2.2	1.4	-10.0	+18.6	-5.8	20.2	-4.0	280MF, 35V 60V SURGE	0.0033 MF, 200V	2,100MF, 35V 60V SURGE	092	L113	36972	2.2K	1.2K 2W	0.22 ±5%, 5W	1.5K	1.8K
LM-B12	12±5%	2.5	2.3	2.1	1.3	-12.0	+20.3	-8.8	22.8	-4.8	280MF, 35V 60V SURGE	0.0033 MF, 200V	2,100MF, 35V 60V SURGE	092	L113	36972	2.2K	1.8K	0.22 ±5%, 5W	1.5K	1.8K
LM-B15	15±5%	2.2	2.0	1.8	1.3	-15.0	+20.2	-8.8	25.6	-6.0	280MF, 35V 60V SURGE	0.0033 MF, 200V	2,100MF, 35V 60V SURGE	092	L113	36485	2.2K	1.8K	0.39 ±5%, 3W	2.7K	1.8K
LM-B18	18±5%	2.0	1.8	1.7	1.3	-18.0	+20.4	-12.3	27.1	-2.7	280MF, 35V 60V SURGE	0.0033 MF, 200V	2,100MF, 35V 60V SURGE	092	L113	36220	2.2K	2.5K	0.39 ±5%, 3W	2.7K	6.8K
LM-B20	20±5%	1.8	1.6	1.5	1.2	-20.0	+20.5	-12.3	28.6	-3.0	280MF, 60V 100V SURGE	0.0033 MF, 200V	2,100MF, 35V 60V SURGE	092	L109	36220	2.2K	2.5K	0.39 ±5%, 3W	2.7K	6.8K
LM-B24	24±5%	1.4	1.3	1.2	1.1	-24.0	+27.1	-18.0	36.2	-3.6	160MF, 60V 100V SURGE	0.0033 MF, 200V	1,120MF, 60V 100V SURGE	036	L109	36220	2.2K	3.6K	0.56 ±5%, 3W	2.7K	6.8K
LM-B28	28±5%	1.3	1.2	1.1	1.0	-28.0	+29.7	-22.5	40.8	-4.2	160MF, 60V 100V SURGE	0.0033 MF, 200V	1,120MF, 60V 100V SURGE	036	L109	36487	2.2K	4.5K	0.56 ±5%, 3W	3.9K	6.8K
LM-B36	36±5%	1.1	1.0	0.90	0.85	-36.0	+34.1	-28.5	49.6	-3.9	160MF, 60V 100V SURGE	0.0033 MF, 200V	1,120MF, 60V 100V SURGE	036	L108	36487	3.3K	5.6K	0.56 ±5%, 3W	3.9K	10.0K
LM-B48	48±5%	0.90	0.85	0.80	0.75	-48.0	+51.0	-40.0	70.0	-5.2	90MF, 85V 100V SURGE	0.001 MF, 200V	400MV, 100V 150V SURGE	036	L108	36487	3.3K	8.0K	0.56 ±5%, 3W	820	10.0K
LM-B60	60±5%	0.70	0.65	0.60	0.54	-60.0	-44.0	-50.0	75.0	-4.5	90MF, 85V 100V SURGE	0.018 MF, 200V	400MF, 100V 150V SURGE	036	L108	35902	4.5K	10.0K 5W	1.0 ±3%, 3W	1.0K	15.0K ±2%, 1/2W



NOTES

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6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS OF CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 CPS; OUTPUT: NOM'L VDC, NO LOAD INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
13. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
14. ON UNITS WITH "V" OPTION, C1 IS 0.01MF±10%, 1000V, PAPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	C9
Q7	C10
Q4	
	C12,C29
	C31
R19-R21	
CR4,5	

MODELS
LM-B100
LM-B120
LM-B150

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

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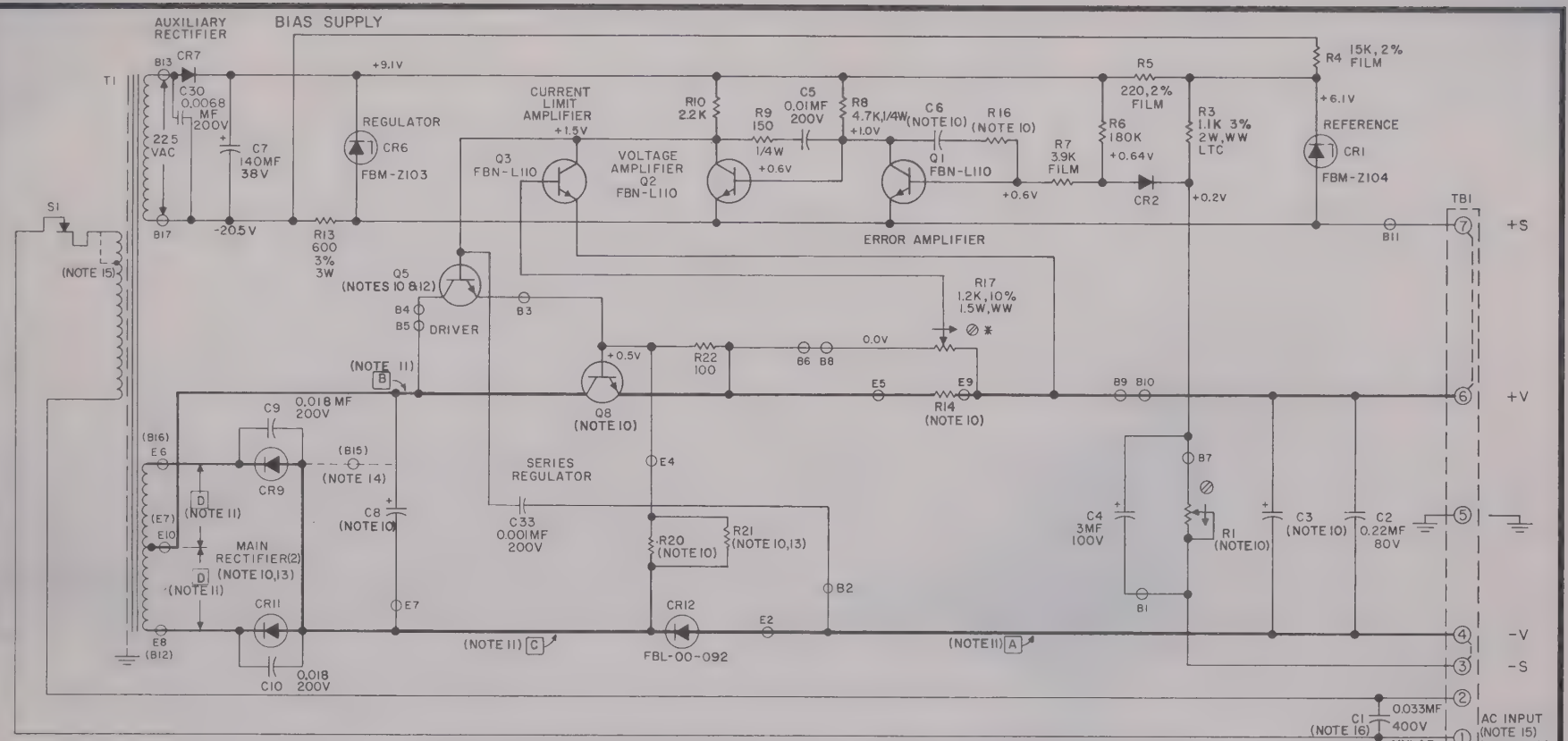
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA ELECTRONICS MELVILLE NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

TABLE I

DATA REFERENCES FOR MODELS LM-B100, LM-B120 AND LM-B150

Model	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltage Measurement						Schematic Components			
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	E (VDC)	F (VDC)	CR8-11 (FBL 00-)	Q5 (FBN-)	R2 ±3%, 5W	R18 ±5%
LM-B100	100±5%	0.37	0.34	0.30	0.28	-100	+71	-80	122	-3.0	-100.6	033	L108	16K	39K, 1/2W
LM-B120	120±5%	0.30	0.28	0.25	0.23	-120	+79	-100	142	-3.1	-120.6	033	L108	20K	43K, 1/2W
LM-B150	150±5%	0.25	0.23	0.20	0.19	-150	+92	-130	171	-3.2	-150.6	064	L115	26K	56K, 1W



NOTES

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3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%, FILM ±5%; UNLESS OTHERWISE NOTED
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - ⏚ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - ⏚ INDICATES CONNECTION TO CHASSIS.
   - ▭ INDICATES ACTUAL UNIT MARKING
   - * SEE INSTRUCTION MANUAL.
   - ⊣▶⊢ LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - ⊸ INDICATES TERMINAL ON PRINTED WIRING BOARD "B", BOARD "E".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55Hz, FOR 360-440Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60Hz; OUTPUT: NOM'L VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. SEE TABLE I FOR COMPONENT VALUES.
11. SEE TABLE I FOR VOLTAGE VALUES.
12. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR & INSTALL WITH NEW TRANSISTOR.
13. ON MODEL LMB-0-32, CR9 & CR11 ARE CONNECTED SO THAT POLARITY IS OPPOSITE TO THAT SHOWN & XFMR CTR TAP CONNECTS TO MINUS LEG, CATHODES OF CR9 & CR11 CONNECT TO PLUS LEG; R21 USED.
14. ⊸ (B16), (E7), (B12) AND (B15) USED FOR MODEL LMB-0-32 ONLY.
15. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
16. ON UNITS WITH "V" OPTION, C1 IS 0.01MF±10%, 1000V, PAPER.

REFERENCE DESIGNATIONS NOT USED	
CR10	R2
Q4	R11,12
Q6,07	
CR4	R18,19
CR8	R21
CR3	
CR5	

MODEL
LMB-0-7
LMB-0-14
LMB-0-32

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY

LAMBDA ELECTRONICS MELVILLE NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

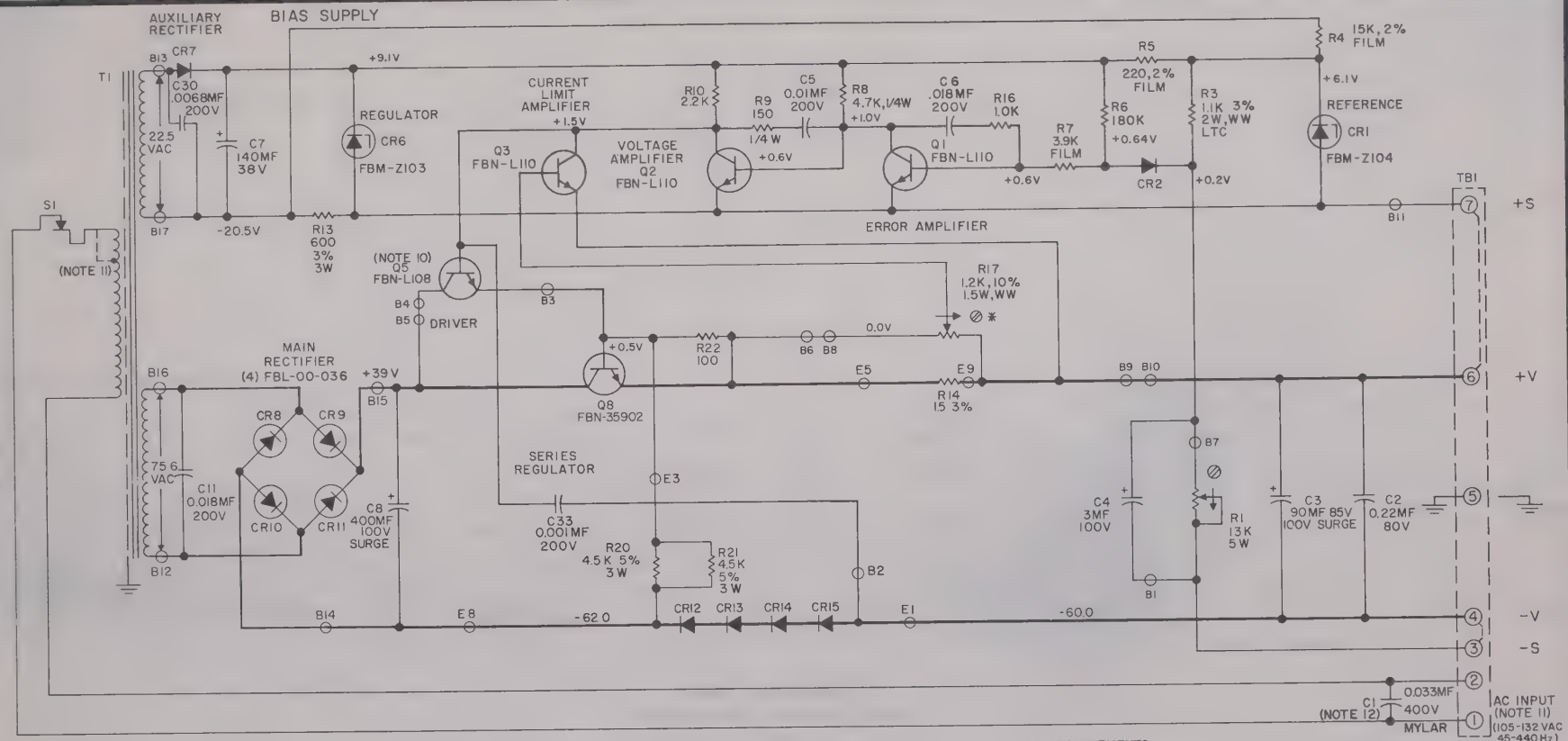
TABLE I

DATA REFERENCES FOR MODELS LMB-0-7,
LMB-0-14 AND LMB-0-32

Model	Voltage Range (VDC)	Max. Current (Amps)				Schematic Voltage Measurement				Schematic Components								
		40°C	50°C	60°C	71°C	A (VDC)	B (VDC)	C (VDC)	D (VAC)	C3	C6	C8	CR9, 11 (FBL 00-)	Q5 (FBN-)	Q8 (FBN-)	R1 5%,5W	R14	R16 10%,1/2W	R20 R21*
LMB-0-7	0-7	2.8	2.6	2.3	1.5	-7.0	+10.5	-7.5	13.0	500MF, 20V 35V SURGE	0.01MF 200V	3600MF, 20V 35V SURGE	092	L113	36972	2,200	0.39 5%, 3W	820	820 10%, 1W
LMB-0-14	0-14	1.6	1.5	1.3	1.2	-14.0	+15.7	-14.5	21.8	280MF, 35V 60V SURGE	0.01MF 200V	2100MF, 35V 60V SURGE	092	L113	36972	3,300	0.56 5%, 3W	820	820 10%, 1W
LMB-0-32	0-32	0.80	0.70	0.60	0.50	-32.0	+21.0	-32.5	33.6	160MF, 60V 100V SURGE	0.018MF 200V	1100MF, 60V 100V SURGE	036	L109	36487	9,000	1.0 3%, 3W	1000	2000 5%, 3W

*R21 only used on Model LMB-0-32

SC8-B0-60A



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - ↟ INDICATES CLOCKWISE ROTATION OF SHAFT.
   - ⊘ INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - ⏚ INDICATES CONNECTION TO CHASSIS.
   - ▭ INDICATES ACTUAL UNIT MARKING
   - ✳ SEE INSTRUCTION MANUAL
   - ⊣▶ LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - ⊖ INDICATES TERMINAL ON PRINTED WIRING BOARD "B", BOARD "E".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55 Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60 Hz , OUTPUT: INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. IF Q5 IS REPLACED, ALWAYS RETAIN RADIATOR AND INSTALL WITH NEW TRANSISTOR.
11. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
12. ON UNITS WITH "V" OPTION, C1 IS 0.01MF ±10%, 1000V, PAPER.

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40 °C	0.7A
50 °C	0.65A
60 °C	0.60A
71 °C	0.54A

REFERENCE DESIGNATIONS NOT USED	
	R2
Q4	R11,12
Q7	R14,15
CR4	R18
CR9	R21
CR3	R24
CR5	R25,27

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

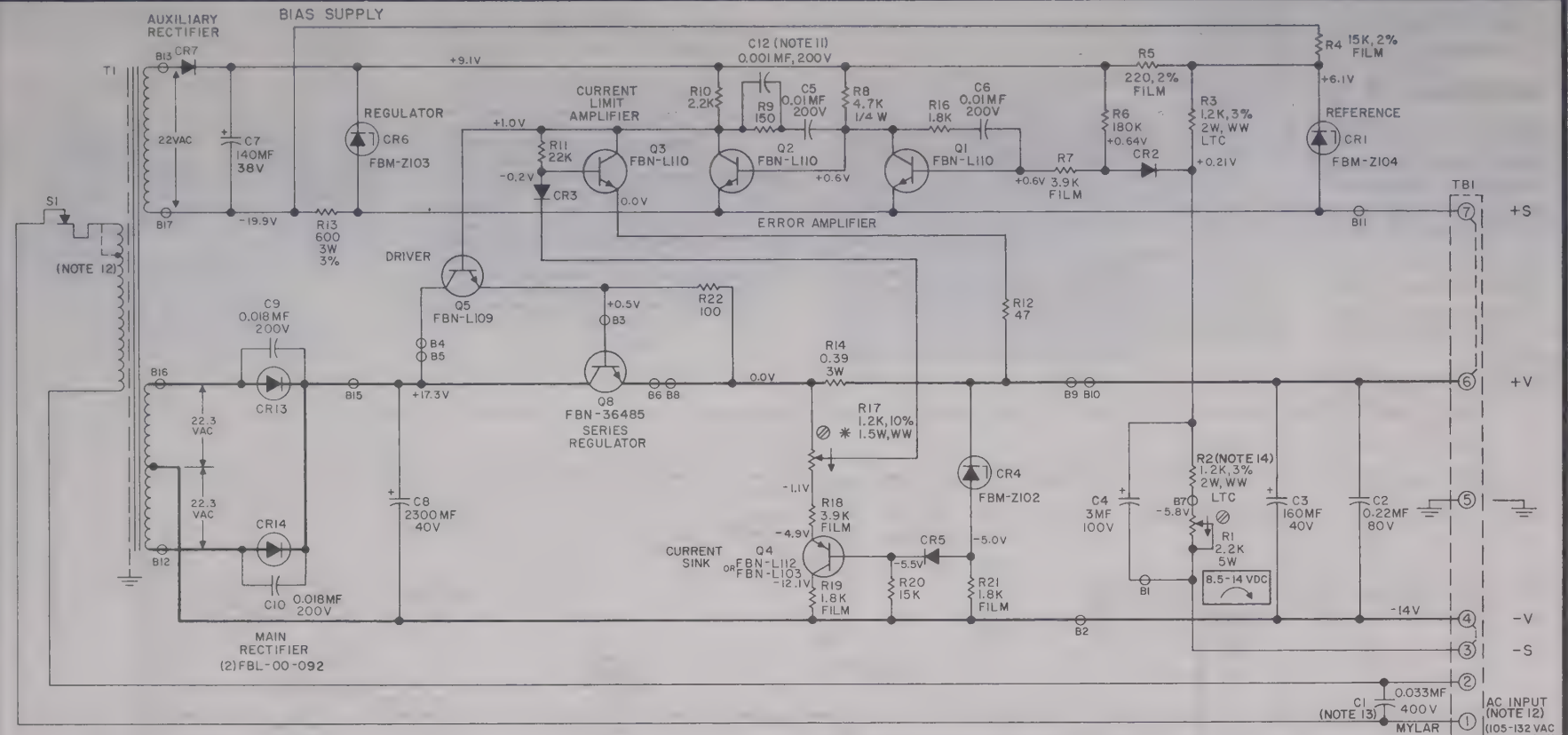
DOTTED CONNECTIONS SHOWN ON TBI INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

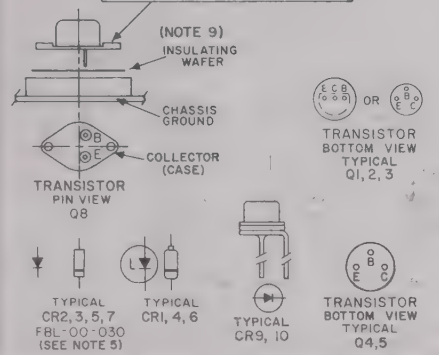
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LMB-0-60 0-60 VDC

LAMBDA ELECTRONICS
MELVILLE NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

SCB-217 C



CAUTION
NOT AT CHASSIS GROUND POTENTIAL
DO NOT SHORT TO CHASSIS GROUND



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%, +100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55 Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 CPS. OUTPUT: 14 VDC, NO LOAD INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. R10 WAS 3.9 K AND R11 WAS 6.8K ON UNITS WITH SERIAL NO. PREFIX 'A'.
11. C12 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.
12. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242 V INPUT (USING TAP) OR FOR 205-265 V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265 V.
13. ON UNITS WITH "V" OPTION, C1 IS 0.01MF ±10%, 1000 V, PAPER
14. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	
Q7	R15
	CR8-12

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	2.1A
50°C	1.9A
60°C	1.7A
71°C	1.3A

(SEE NOTE 7)

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

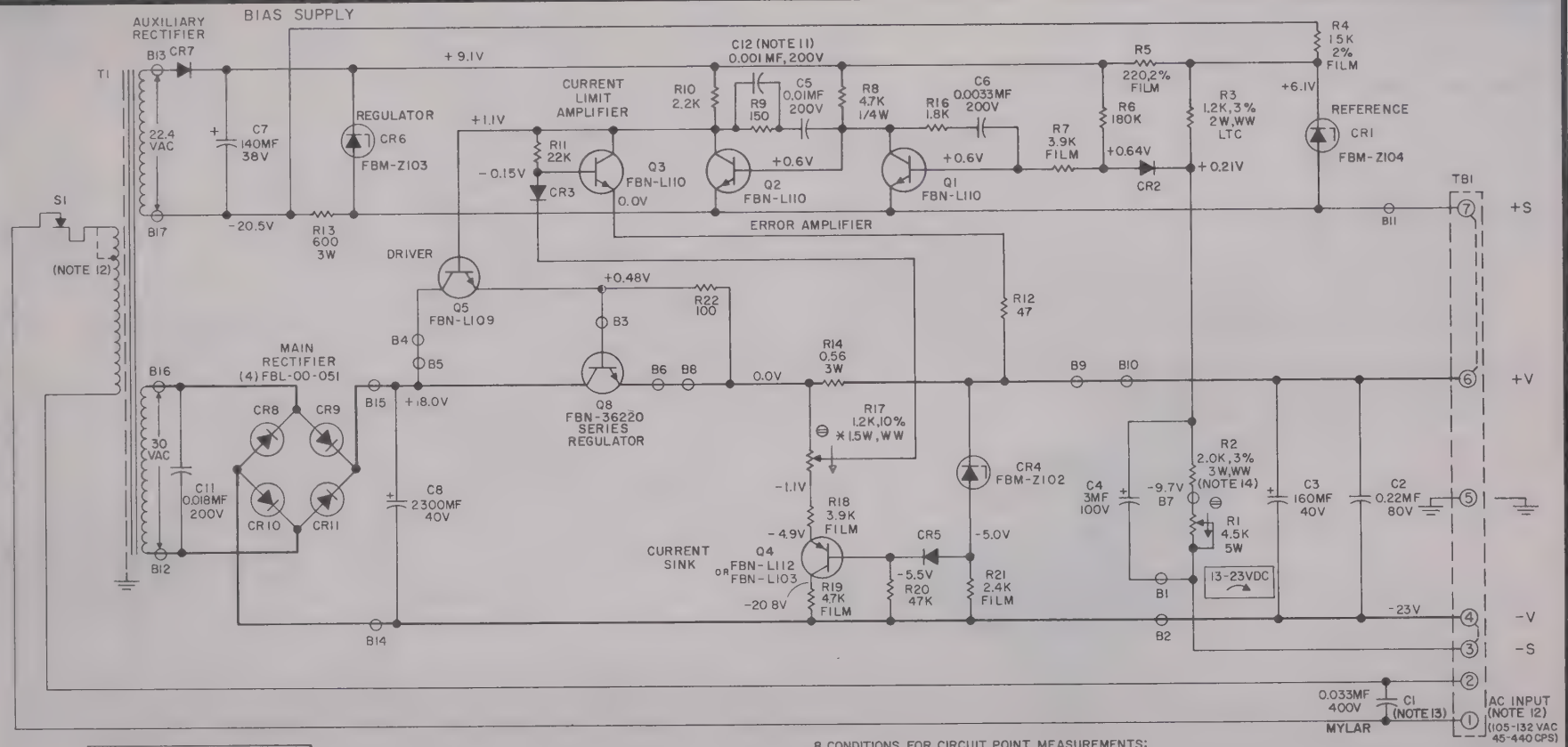
DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

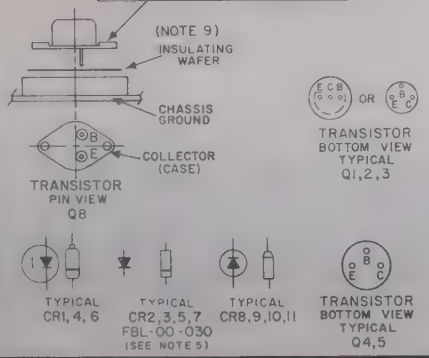
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM217, 8.5-14VDC

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

SCB-218C



CAUTION
NOT AT CHASSIS GROUND POTENTIAL
DO NOT SHORT TO CHASSIS GROUND



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55 Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115VAC, 60CPS; OUTPUT: 23VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. R10 WAS 3.9K AND R11 WAS 6.8K ON UNITS WITH SERIAL PREFIX 'A'.
11. C12 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.
12. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
13. ON UNITS WITH "V" OPTION, C1 IS 0.0MF ±10%, 1000V, PAPER.
14. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	
Q7	R15
C9	
C10	

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	1.5A
50°C	1.3A
60°C	.2A
71°C	1.0A

(SEE NOTE 7)

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

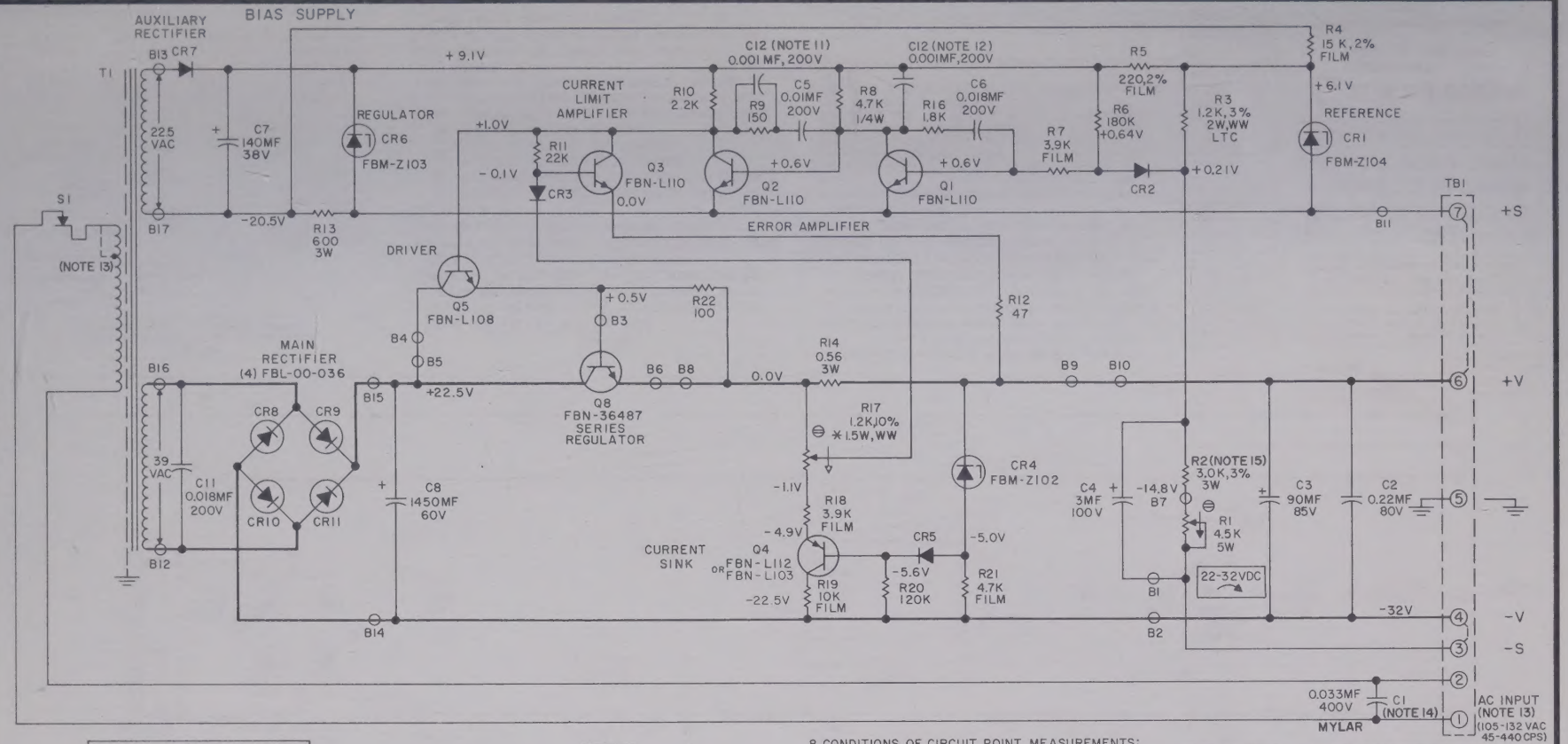
DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

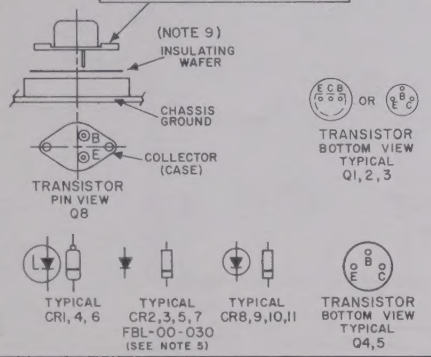
SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM218, 13-23VDC

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.

SCB-219C



CAUTION
NOT AT CHASSIS GROUND POTENTIAL
DO NOT SHORT TO CHASSIS GROUND



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - ✳ SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55Hz, FOR 360-440Hz CONSULT FACTORY.
8. CONDITIONS OF CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60CPS; OUTPUT: 32VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. R10 WAS 3.9K AND R11 WAS 6.8K ON UNITS WITH SERIAL NO. PREFIX 'A'.
11. C12 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.
12. C12 CONNECTED ACROSS R9 ON UNITS WITH SERIAL NO. PREFIX D.
13. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
14. ON UNITS WITH "V" OPTION, C11 IS 0.01MF±10%, 1000V, PAPER.
15. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER (SEE NOTE 7)

REFERENCE DESIGNATIONS NOT USED	
Q6	C9
Q7	C10
R15	

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	1.2A
50°C	1.1A
60°C	1.0A
71°C	0.8A

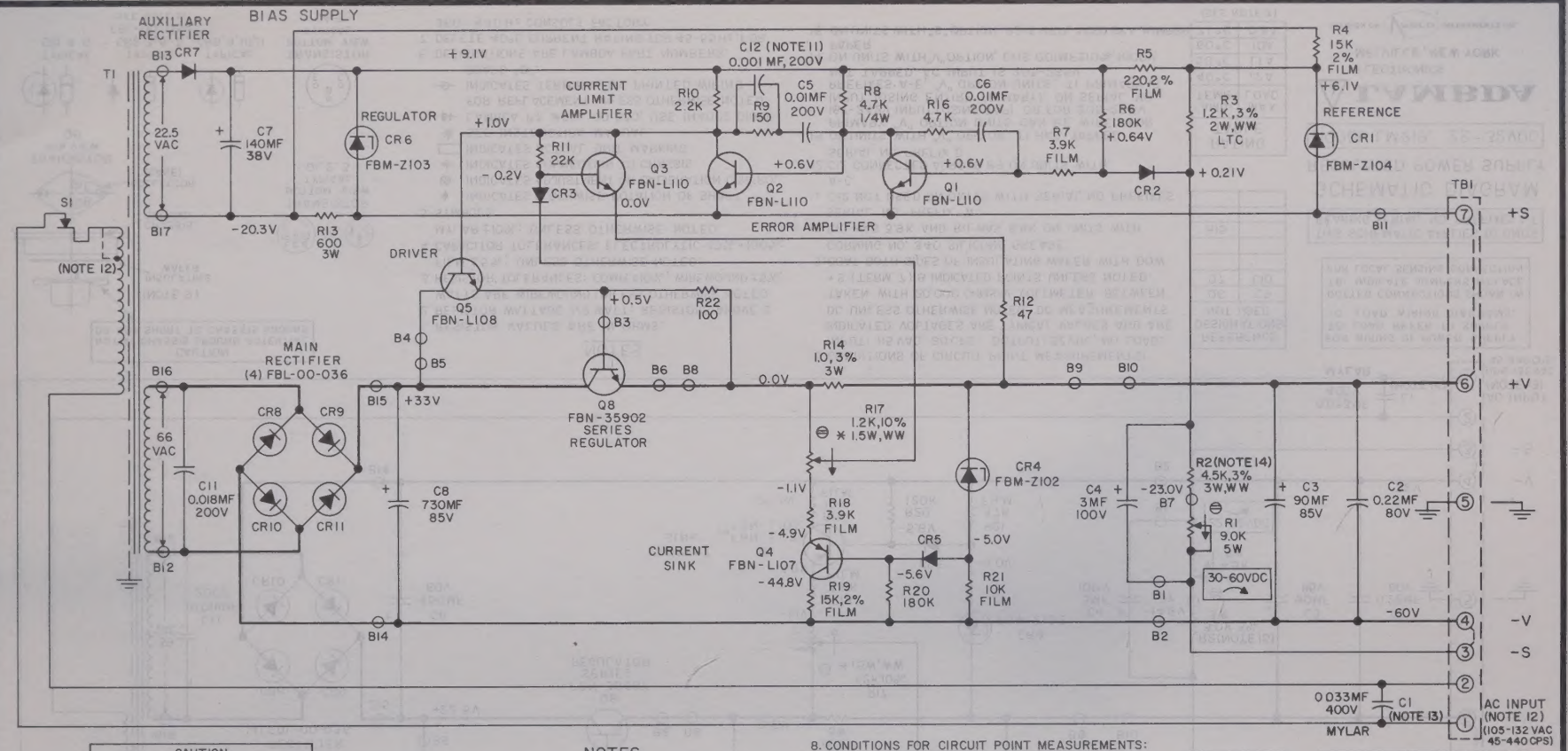
FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

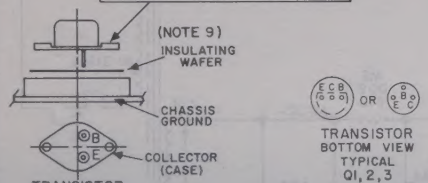
THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM219, 22-32VDC

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
DIVISION OF Veeco INSTRUMENTS INC.



CAUTION
NOT AT CHASSIS GROUND POTENTIAL
DO NOT SHORT TO CHASSIS GROUND



NOTES

1. RESISTOR VALUES ARE IN OHMS.
2. RESISTOR WATTAGE 1/2 WATT; RESISTORS ABOVE 2 WATTS ARE WIREWOUND UNLESS OTHERWISE NOTED.
3. RESISTOR TOLERANCES: COMP. ±10%; WIREWOUND ±5%; FILM ±5%; UNLESS OTHERWISE NOTED.
4. CAPACITOR TOLERANCES: ELECTROLYTIC -10%,+100%; MYLAR ±10%; UNLESS OTHERWISE NOTED.
5. SYMBOLS:
   - INDICATES CLOCKWISE ROTATION OF SHAFT.
   - INDICATES ADJUSTMENT OR CALIBRATION CONTROL.
   - INDICATES CONNECTION TO CHASSIS.
   - INDICATES ACTUAL UNIT MARKING
   - SEE INSTRUCTION MANUAL.
   - LAMBDA PT. #FBL-00-030; USE IN4002 DIODE FOR REPLACEMENT UNLESS OTHERWISE NOTED.
   - INDICATES TERMINAL ON PRINTED WIRING BOARD "B".
6. DESIGNATIONS ARE LAMBDA PART NUMBERS.
7. DELETE 40°C CURRENT RATING FOR 45-55 Hz, FOR 360-440 Hz CONSULT FACTORY.
8. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 CPS; OUTPUT: 60VDC, NO LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES AND ARE DC UNLESS OTHERWISE NOTED. DC MEASUREMENTS TAKEN WITH 20,000 OHMS/V VOLTMETER BETWEEN +S (TERM. 7) & INDICATED POINTS UNLESS NOTED.
9. COAT BOTH SIDES OF INSULATING WAFER WITH DOW CORNING NO. 340 SILICONE GREASE.
10. RI0 WAS 3.9K AND RI1 WAS 6.8K ON UNITS WITH SERIAL NO. PREFIX 'A'.
11. C12 NOT USED ON UNITS WITH SERIAL NO. PREFIXES A-C.
12. ON UNITS WITH "V" OPTION, T1 HAS TAPPED PRIMARY. "V" OPTION UNITS CAN BE WIRED FOR 187-242V INPUT (USING TAP) OR FOR 205-265V INPUT (USING ENTIRE PRIMARY). ON SERIAL NO. PREFIXES A-E, "V" OPTION UNITS; T1 PRIMARY IS NOT TAPPED. AC INPUT IS 205-265V.
13. ON UNITS WITH "V" OPTION, C1 IS 0.01 MF±10%, 1000V, PAPER.
14. ON UNITS WITH "S" OPTION, R2 IS REPLACED BY A JUMPER.

REFERENCE DESIGNATIONS NOT USED	
Q6	
Q7	RI5
C9	
C10	

RATING TABLE	
AMB. TEMP.	MAX. LOAD
40°C	0.70A
50°C	0.65A
60°C	0.60A
71°C	0.45A

(SEE NOTE 7)

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAMS.

DOTTED CONNECTIONS SHOWN ON TB1 INDICATE JUMPERS IN PLACE FOR LOCAL SENSING CONNECTION.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIXES A-F

SCHEMATIC DIAGRAM
REGULATED POWER SUPPLY
MODEL LM220, 30-60VDC

LAMBDA
ELECTRONICS
MELVILLE, NEW YORK
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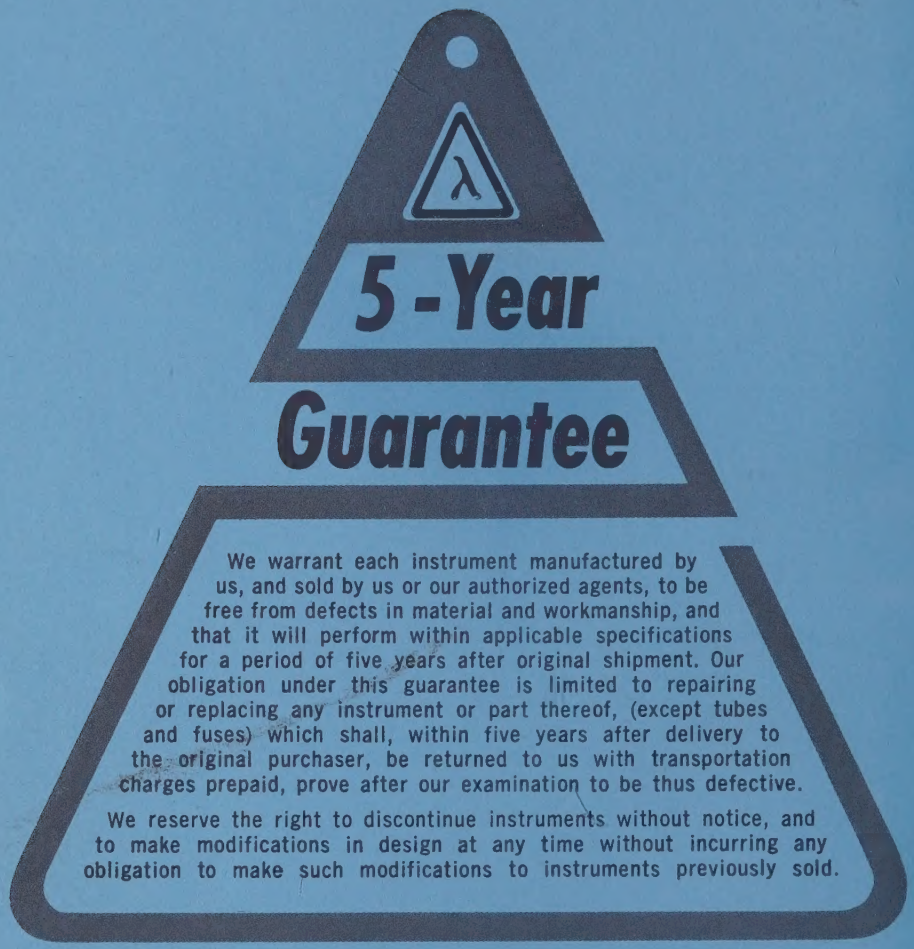
5-Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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